

Gov. Doc.
Can.
Ag.

Canada, Agriculture, Dept. of. Experimental
Farms

1955 - 1956



ANNUAL REPORT



OF THE DIRECTOR
EXPERIMENTAL FARMS SERVICE
DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

EXPERIMENTAL FARMS SERVICE

Director, C. H. GOULDEN, B.S.A., M.Sc., Ph.D., LL.D.

Associate Director, J. C. WOODWARD, B.S.A., M.S., Ph.D.

Central Experimental Farm, Ottawa, Ontario.

Division	Chief
Animal Husbandry.....	K. Rasmussen, B.S.A., M.Sc., Ph.D.
Apiculture.....	C. A. Jamieson, B.S.A., Ph.D.
Cereal Crops.....	D. G. Hamilton, B.Sc., M.S., Ph.D.
Field Husbandry, Soils & Agricultural Engineering.....	P. O. Ripley, B.S.A., M.Sc., Ph.D.
Forage Crops.....	T. M. Stevenson, B.S.A., M.Sc., Ph.D.
Horticulture.....	H. Hill, B.S.A., M.Sc., Ph.D.
Illustration Stations.....	A. E. Barrett, B.S.A., M.Sc.
Poultry.....	H. S. Gutteridge, B.S.A., M.Sc.
Tobacco.....	N. A. MacRa B.A., M.Sc., Ph.D.

NORTHERN CANADA

Ottawa, Ontario, F. S. Nowosad, B.S.A., M.Sc., Officer-in-Charge.

Associated Substation: Fort Chimo, Quebec, (Sub-Arctic Agriculture).

Fort Simpson, Northwest Territories, Experimental Farm, J. A. Gilbey, B.S.A., M.Sc., Superintendent.

Associated Substation: Aklavik, Northwest Territories, (Permafrost Agriculture).

Whitehorse, Yukon Territory, Experimental Farm, W. H. Hough, B.S.A., M.S., Superintendent.

NEWFOUNDLAND

St. John's West, Experimental Farm, H. W. R. Chancey, B.S.A., M.S.A., Superintendent.

PRINCE EDWARD ISLAND

Charlottetown, Experimental Farm, R. C. Parent, B.S.A., M.Sc., Superintendent.

Summerside, Experimental Fur Ranch, C. K. Gunn, B.Sc., M.Sc., Ph.D., Superintendent.

NOVA SCOTIA

Nappan, Experimental Farm, S. B. Williams, B.S.A., M.Sc., Superintendent.

Kentville, Experimental Farm, C. J. Bishop, B.Sc., A.M., Ph.D., Superintendent.

NEW BRUNSWICK

Fredericton, Experimental Farm, S. A. Hilton, B.S.A., M.S.A., Superintendent.

Associated Substations: McDonald's Corner (Horticulture); Tower Hill (Blueberries); Alma (Potato Breeding).

QUEBEC

Lennoxville, Experimental Farm, R. Mercier, B.Sc., M.Sc., Ph.D., Superintendent.

Ste. Anne de la Pocatière, Experimental Farm, J. R. Pelletier, B.S.A., M.A., M.Sc., Superintendent.

L'Assomption, Experimental Farm, R. Bordeleau, B.S.A., Superintendent.

Associated Substation: Lavaltrie (Tobacco).

Normandin, Experimental Farm, A. Belzile, B.S.A., Superintendent.

Caplan, Experimental Substation, L. J. Bellefleur, B.S.A., Superintendent.

Ste. Clothilde, Horticultural Substation (Organic Soils). Associated with the Horticulture Division, Central Experimental Farm, Ottawa, Ontario.

Concluded on Inside Back Cover

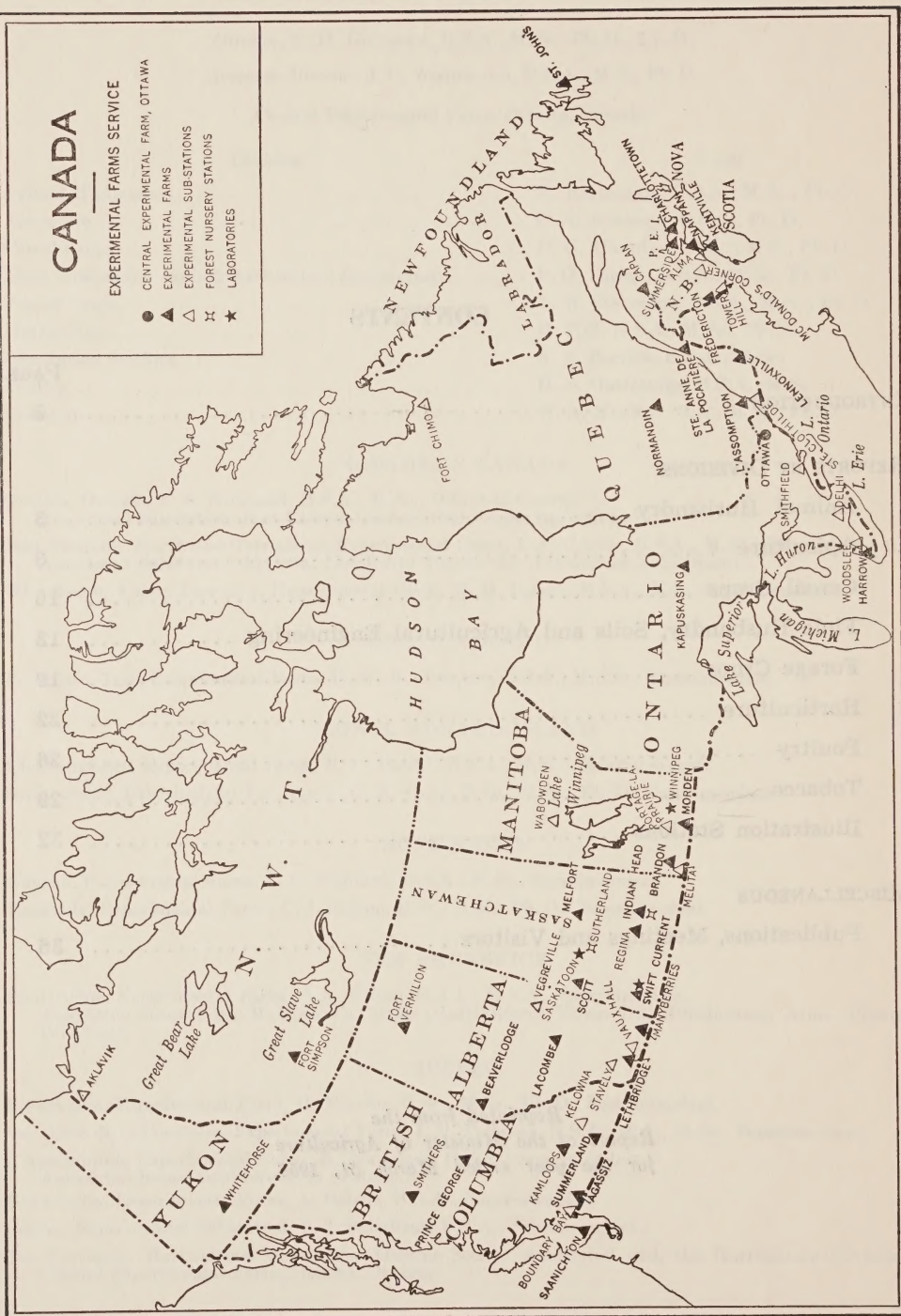
CONTENTS

	PAGE
INTRODUCTION	3
REPORTS BY DIVISIONS	
Animal Husbandry	3
Apiculture	8
Cereal Crops	10
Field Husbandry, Soils and Agricultural Engineering	13
Forage Crops	19
Horticulture	22
Poultry	26
Tobacco	29
Illustration Stations	32
MISCELLANEOUS	
Publications, Meetings and Visitors	36

*Reprinted from the
Report of the Minister of Agriculture
for the year ended March 31, 1956.*

EXPERIMENTAL FARMS SERVICE

- CENTRAL EXPERIMENTAL FARM, OTTAWA
- ▲ EXPERIMENTAL FARMS
- △ EXPERIMENTAL SUB-STATIONS
- ⌘ FOREST NURSERY STATIONS
- ★ LABORATORIES



EXPERIMENTAL FARMS SERVICE

The Experimental Farms Service dates back to 1886, when an Act of Parliament established the original five farms. The aim was to solve the production problems of the Canadian farmer and, on reaching solutions, to pass the resulting knowledge on to him in an intelligible form. The role has not changed through the years but the program has expanded to meet the ever-increasing range and complexity of production problems. This report is intended to give a representative sample of contributions during the year. It is a series of practical highlights followed by a list of publications that indicate the scope of the work of the Service.

A new substation was opened at Vegreville, Alta, specifically to study the acute production problems associated with solonetz soils.

Increased emphasis has been placed on work in Northern Canada. Preliminary studies were carried out at Fort Chimo and the work will be expanded in 1956. An officer-in-charge, Northern Agriculture, has been appointed to take immediate responsibility for surveys and investigations in the Yukon Territory, the Northwest Territories, and in those areas of provinces that lie north of the southern limit of permafrost.

The present Director and Associate Director were appointed in March and April of 1955. Since that time, a number of inspection trips have been made and 330 members of the professional staff have been interviewed with a view to studying their individual research problems and to co-ordinating the total research effort of the Service.

ANIMAL HUSBANDRY

ANIMAL BREEDING

FROZEN BULL SEMEN IS AN AID IN INTEGRATING DAIRY CATTLE BREEDING RESEARCH

A laboratory has been established at Ottawa where semen from the Holstein stud at Ottawa, the Ayrshire studs at Charlottetown and Normandin, and the Jersey stud at Lennoxville can be frozen for shipment to all Experimental Farm dairy herds. Storage facilities for frozen semen have been arranged at Branch Farms. A mixture of dry ice and alcohol provides suitable storage temperatures of -79° C. Successful long distance shipments of frozen semen have been made from Ottawa to Prince George, Fredericton, Lethbridge, and Morden. This development will provide for an adequate number of progeny from each bull on test to give a valid basis for sire evaluation.

NEW "CORRECTION FACTORS" DEVELOPED FOR MILK PRODUCTION

At Ottawa, the use of mechanical tabulation with punched card machines has made possible the analysis of several generations of breeding records from the various dairy cattle herds in the Experimental Farms Service. The analyses completed to date provide important information for deriving yield "correction factors" for age and season at freshening so that unbiased estimates of producing abilities of cows and transmitting abilities of bulls can be made from records started at different times and ages. Different herds within breeds produce at significantly different levels and the relationship between milk yield and age is different among herds and breeds, with the Ayrshires in these herds reaching their maximum production at a younger age than the Holsteins. The season of the year as well as the year when lactation commences has a definite effect on yield.

LACOMBE—A NEW BREED OF BACON HOGS

In 1947, the Experimental Farms Service undertook research on the development of new bacon breeds from hybrid foundations. After eight years of thorough testing, selection, and a moderate degree of inbreeding, a new breed has been produced at the Experimental Farm, Lacombe. Officially named the "Lacombe", this breed is a combination of three breeds—the Danish Landrace, the Chester White, and the Berkshire. It is white with flop ears, and has proved the equal of high quality Yorkshires in weaned litter size and in carcass quality. Weaning weight has averaged about five pounds greater per pig and pigs have reached market weight from one to two weeks earlier than the Yorkshire.

Crossbreds between the Lacombe and the Yorkshire have proved to be equal or superior to either parental breed in all measures of carcass quality. Moreover, in comparison with the parental breeds, they show heavier weaning weight and greater rate of gain, both of which are manifestations of hybrid vigor.

Field tests to provide information on the value of the Lacombe for top-crossing in commercial herds are under way with twenty commercial breeders in Alberta.

CROSSBREEDING FOR MARKET LAMB PRODUCTION

Crossbred lambs sired by Suffolk rams were heavier at weaning and went to market earlier at heavier weights than crossbred lambs sired by rams of other breeds tested in an experiment involving several breeds. Among the crossbred ewes used as dams, the North Country Cheviot-cross ewes had the highest rate of gain in their offspring. They also had the lowest lamb mortality though a slightly lower lambing percentage.

FERTILITY IN CATTALO IS INCREASING

The percentage of potentially fertile cattalo bulls appears to have risen sharply in the past two years. The crossing of buffalo and domestic cattle to produce a new, hardy range breed of cattalo has been carried out for over 25 years but, until recently, male sterility has rendered progress practically impossible. Only very few males had proved fertile in breeding tests and early attempts to obtain semen samples to evaluate the individuals had been relatively unsuccessful. However, in 1954, 26 bulls were tested by unilateral castration and five indicated fertility. During the fall of 1955, using an electro-ejaculator, semen samples were obtained from the same five bulls as well as from an additional 22 long yearlings. The five previously tested bulls again had good to fair semen while four of the long yearlings had good to excellent semen on the basis of density and motility of samples. An additional ten had good to fair ratings while only eight were classified as sterile.

ANIMAL NUTRITION

MINIATURE FORAGE HARVESTER FACILITATES DIGESTIBILITY STUDIES

A small harvester based on modification of a 30-inch rotary mower attached to a Gravelly tractor was developed at Ottawa in co-operation with Agricultural Engineering. The machine, which cuts, chops, and blows the cut material into a large burlap bag, is capable of harvesting about 400 pounds of green material per hour when cutting forage of average density and approximately 12 inches in height. This unit considerably reduced the time and labor required to harvest fresh forage for sheep digestibility trials during the summer of 1955 because it prepared the forage for feeding and sampling in one operation. It is expected that the machine will find other applications such as for small-scale silage and mechanical grazing studies.

DETERMINATION OF PROTEIN REQUIREMENTS OF CALVES

In an experiment conducted co-operatively with Science Service at Ottawa, Holstein and Ayrshire calves on a filled-milk diet containing 24.3 per cent protein (dry matter basis) grew better from one to four weeks of age than similar calves on filled-milk diets containing 13.4, 19.0, and 29.7 per cent protein. During the four- to eight-week period highest growth rates were obtained on the 19.0 per cent protein diet.

FECAL NITROGEN IS A PROMISING INDICATOR OF DIGESTIBILITY FOR GRAZING STUDIES

Data from 58 digestibility trials with sheep at Ottawa, in a co-operative experiment with Science Service, indicated that fecal nitrogen can be a reliable index of the digestibility of herbage consumed by grazing animals. A definite relationship exists between fecal nitrogen and digestibility.

The average organic matter digestibility coefficients determined conventionally and from feces nitrogen were 67.6 and 67.2, respectively.

GRAINS GROWN ON GRAY WOODED SOILS MAY BE LOW IN VITAMIN B

At Beaverlodge, vitamin B supplementation of rations of grains from gray wooded soils had a beneficial effect on the weaning weight of pigs farrowed by gilts. The weaning weights from the basal and supplemented rations were 26.1 and 33.1 pounds, respectively. Pigs from mature sows showed no significant difference in weaning weights. Litter size was similar in both groups. Assays of milk showed an average riboflavin content of 1.32 and 0.87 micrograms per milliliter at one and six weeks, respectively, after farrowing in the basal group, and 1.57 and 1.45 in the supplemental group.

A BARLEY RATION IS MORE DIGESTIBLE BY SWINE THAN AN OAT RATION

In a digestibility trial at Lethbridge, fattening pigs were able to digest 83 per cent of the dry matter of a barley ration and 72 per cent of the dry matter of an oat ration being used in a co-operative swine-feeding experiment across Canada. The grain portion of one ration was made up entirely of barley and of the other ration entirely of oats. Both rations were supplemented to equalize the protein content. The barley ration contained 1,440 digestible calories per pound and the oat ration 1,340. The pigs gained 1.2 pounds per day on the barley ration and 0.9 pound per day on the oat ration.

GAINS OF CATTLE VARY WITH RATES OF STOCKING

Rate of stocking studies at Manyberries showed that cows with calves had average gains of 164, 216, and 256 pounds when the pastures were stocked to supply 20, 30, and 40 acres per cow for the summer grazing season. The corresponding weaning weights for the calves were 345, 371, and 359 pounds. The cows used in the experiment had been carried on the same pastures as yearlings and two-year-olds and, at those ages, made gains in the same order.

PROTEIN LEVEL IN RANGE GRASSES AFFECTS RATE OF GAIN IN YEARLING CATTLE

At Manyberries, composite samples of clipped native forage were collected at bi-weekly intervals and analyzed for protein content. The protein content declined from a level of 9 to 10 per cent in June to 6 per cent in October. Average daily gains of yearling steers on summer range were 2.43 pounds when the grass contained more than 8 per cent protein, 1.80 pounds when the grass contained between 7 and 8 per cent protein, and 0.93 pound when the grass contained less than 7 per cent protein.

MEAL RATIONS FOR CALVES ON LIMITED MILK DIETS

In feeding trials with dairy calves at Ottawa, a complex all-plant-protein meal fed with a total of 360 pounds of whole milk produced significantly higher gains during the first six weeks than a similar meal in which the corn meal portion was replaced by an equivalent amount of oats and barley. A simple meal formula containing five ingredients, fed with reconstituted skim milk which replaced whole milk gradually, beginning with the second week, resulted in a gain in skeletal growth equivalent to that of the more complex rations fed with whole milk. Calves consumed a greater amount of meal and hay on the reconstituted milk diet. Aureomycin supplement added to the meal increased weight gains by 7 to 20 per cent.

COMBINATIONS OF GRASS SILAGE AND HAY FOR MILK YIELD

No significant differences were found in milk yield, butterfat content, or body weights of Ayrshire cows at Charlottetown when grass silage as the sole roughage was compared with rations of grass silage plus hay at rates of $\frac{1}{3}$, $\frac{2}{3}$, and 1 pound per 100 pounds live weight. All cows were fed concentrates at the rate of 1 pound per 4 pounds of milk produced. Progressive increases in total digestible nutrients and dry matter consumption were noted as the hay feeding increased. This increase was significantly greater for higher rates of hay feeding. Cows fed silage as the sole roughage showed a craving for hay.

YEARLING HEIFERS WINTER BETTER ON GRASS SILAGE AND HAY THAN ON EITHER ROUGHAGE ALONE

At Lennoxville, yearling Shorthorn heifers being wintered on a ration of grass silage and hay made average daily gains of 0.56 pound, while those on grass silage alone or on hay alone gains of 0.40 pound and 0.26 pound, respectively. This difference between the rations was consistent from year to year for a four-year period indicating that a combination of hay and grass silage is a better ration for yearling heifers than either roughage fed alone.

SUPPLEMENTAL FEEDING OF YEARLING CATTLE ON GRASS

In experiments at Manyberries, supplemental feeding was started after the grasses had "cured", usually during the third week in July, and continued until the third week in October. In a four-year experiment, steers receiving 2 pounds of linseed oilcake per head daily gained 1.73 pounds per day whereas steers receiving no supplement gained 1.17 pounds per day.

In two years, three supplements were fed, all containing approximately equal amounts of total digestible nutrients but different amounts of protein. The supplements fed per head daily were 2 pounds of linseed oilcake containing 0.74 pound of protein, 2.6 pounds of dried brewers' grain containing 0.56 pound of protein, and 2.4 pounds of ground oats containing 0.32 pound of protein. The average daily gains of steers on these three supplements were 1.78 pounds, 1.48 pounds, and 1.54 pounds, respectively.

THE PROPORTIONS OF HAY AND GRAIN FED TO STEER CALVES AFFECT GAINS AND CARCASS QUALITY

At Lethbridge, steer calves fed hay and grain in the proportions of 2:1, 1:1, and 1:2 gained 1.51, 1.81, and 1.96 pounds per day from 400 to 900 pounds body weight. The feed required per pound of gain was in the reverse order. The relative economy of these ratios of hay to grain for fattening cattle depends on the relative costs of hay and grain. From this experiment, it was calculated

that if the grain cost was no more than twice that of hay, it was most profitable to feed hay and grain in the proportions of 1:2; if the cost of grain was two and one-half times that of hay, it was most profitable to feed grain and hay in equal amounts; and if grain costs more than four times as much as hay, it was most profitable to feed hay and grain in the proportion of 2:1.

EFFECTS OF SEX AND OF THE AGE OF MALE CASTRATION ON GROWTH AND CARCASS QUALITY IN YORKSHIRE SWINE

In an experiment at Kapuskasing, male pigs castrated at 6 weeks produced a shorter length of side than boars and gilts. Males castrated at 12 and 16 weeks produced shorter length of side than boars although not differing significantly from gilts. Although most carcasses were considered to have firm fat, the males castrated at 6 weeks produced the firmest fat. They also showed the highest dressing percentage but the lowest carcass score. Animals castrated at 6 weeks consumed more feed from the age of 8 weeks to the time of slaughter than either the boars or animals castrated at 12 and 16 weeks. All males reached 205 pounds four to five days earlier than the gilts.

GRASS SILAGE PLUS DIFFERENT LEVELS OF GRAIN FOR FATTENING STEERS

At Ottawa, two years' results showed that steers on rations of grass silage alone or silage plus 4, 8, or 10 pounds of grain per head daily produced daily gains of 0.75, 1.50, 2.00, and 2.20 pounds, respectively. Grass silage was full-fed to all groups. Grass silage alone proved to be a good growing ration but not a finishing ration. The daily addition of 4 pounds of grain doubled the daily gains and provided for finishing but only after a lengthy finishing period. Eight and ten pounds of grain per head daily produced very good gains and satisfactory finish in a normal feeding period.

TWO-YEAR-OLD STEERS CAN BE FINISHED ON AFTERMATH

A five-year trial conducted at Ottawa showed that the gains of 62 steers finished on aftermath were equal to the gains of an equal number of steers finished on permanent pasture plus 5½ pounds of grain per head daily. The gains of each group averaged approximately 2 pounds per head daily. Carcass quality was slightly higher for the aftermath steers. Due to the slightly higher grade and dressing percentage and the saving in grain, an extra profit of \$13.88 per head was obtained from the aftermath group. This profit would have been greater if the extra labor required for grain feeding had been considered.

ROTATION-OF-CROPS PASTURE SUPERIOR TO PERMANENT PASTURE

A rotation of crops has provided greater and more uniform production throughout the grazing season than permanent pasture when both were grazed by steers. For fifteen years at Ottawa, a four-year rotation of crops consisting of oats and sudan grass the first year and a grass-legume mixture in the following three years was compared with a permanent pasture grazed continuously. In the crop rotation, half of each field was grazed in rotation during the first part of the summer, the other half was cut early for hay, and the aftermath grazed. There was a 21.5 per cent increase in total production from the pasture in the crop rotation over the permanent one. On the permanent pasture, 75 per cent of the gain was obtained during the first eight weeks and 25 per cent in the last twelve weeks. On the pasture in the crop rotation, 50 per cent of the gain occurred in the first eight weeks and 50 per cent in the last twelve weeks.

PHYSIOLOGY

VALUE OF SOME BLOOD CONSTITUENTS OF NORMAL PIGLETS

In studies of piglet mortality at Ottawa, determinations were made of the normal hemoglobin and glucose levels in piglets from birth to two weeks of age. Hemoglobin values averaged 12.3 grams per 100 milliliters of blood at birth and declined steadily to an average of 8.5 grams at two weeks of age. Blood glucose values averaged 146.0 micrograms per 100 milliliters of blood at birth. After a decline to 126.5 micrograms at 2 days of age, the glucose level rose to 146.8 micrograms at 7 and 14 days of age. This high glucose level, compared with the adult level of 45 to 75 micrograms, is attributed to the large amount of milk sugar in sows' milk. The female piglets had slightly higher average values than the males for both components studied.

THE EFFECT OF LEGUME PASTURE IN THE PREGNANT SOW RATION ON THE BLOOD OF THE PIGLET

In a study of the effect of pregnant sow rations on blood component values of the piglet, it was found that there was no practical difference in blood cell volume, hemoglobin, and blood glucose of piglets born to dry-lot sows and sows fed on legume pasture.

DAIRY TECHNOLOGY

STARTER CULTURES INFLUENCE CHEESE FLAVOR

Comparison of a widely used mixed-strain starter culture and a New Zealand single-strain culture revealed significantly higher initial flavor scores for experimental cheese made with the mixed culture. After three months curing, the results were reversed with the flavor scores favoring the single-strain culture. A cheese starter culture containing four strains of lactic cocci has been advertised widely as a means of eliminating bitter flavor in cheddar cheese made from pasteurized milk. When compared with a multi-strain culture of the type commonly used in Canadian cheese factories, the new starter proved to give more rather than less bitter flavor.

LOW BACTERIA COUNT MILK MAKES BETTER CHEESE

Examination of the results of 252 vats of cheese at initial grading revealed that milk of low bacteria count in most instances resulted in high-scoring cheese. High count milk resulted in a considerable range of initial flavor scores, with a tendency for flavor scores to decrease as counts increased. This tendency has not been related directly to any specific type of organism.

APICULTURE

TESTING, HANDLING, AND MANAGEMENT OF BEES

ANTIBIOTICS USEFUL FOR CONTROL OF EUROPEAN FOULBROOD

Tests at Beaverlodge on the control of European foulbrood show that erythrocin (erythromycin), either the soluble or emulsion formulations, is effective in arresting development of this disease. Two other effective antibiotics, terramycin and streptomycin, are in current use by beekeepers. Treatment of colonies in areas where the disease is prevalent should be applied four weeks after the bees are installed in their hives.

NOSEMA DISEASE SHOULD BE CONTROLLED IN PACKAGE COLONIES

Inoculation tests of bees with spores of *Nosema apis* indicate that a light infection of this disease does not significantly reduce the life span of the bee. When the infection is heavy, however, the life of the bee is reduced to one-half or less that of the normal healthy bee.

The feeding of Fumidil B to package bees at Brandon, Beaverlodge, and Charlottetown did not result in increased honey production unless the initial infection rate exceeded 10 to 15 per cent. It is recommended, however, that beekeepers feed the antibiotic when installing package bees as the initial infection of bees arriving from the south will vary greatly from year to year. Treatment of package bees will also protect queens from being infected with this disease.

BEES POISONED BY DIELDRIN

A project was conducted at Ste. Anne de la Pocatiere to determine the effect of dieldrin sprays on honeybees in an orchard. Two applications of the insecticide were used; the first while the blossoms were in the pink stage and the other after the majority of petals had fallen from the bloom. No abnormal bee mortality was evident following the first application of dieldrin but a heavy mortality occurred following the second spray of this insecticide. The colony suffering the heaviest damage lost 1,500 bees on the day following application of the spray.

PROCESSING AND STORAGE OF HONEY

RECRYSTALLIZED HONEY IS AFFECTED BY MOISTURE CONTENT

The effect of storage on the quality of recrystallized honey was examined in four lots with different moisture contents. With an increase in moisture content, the texture became softer at room storage. The lot with the highest moisture content (19.5 per cent) began to separate into a liquid and solid phase within a few months.

No difference was noted in the texture of honey due to the time held in cold storage (four to seven days).

HONEY PROCESSING EQUIPMENT SUITABLE FOR THE COMMERCIAL PACKER

A plate-type pasteurizer and cooler, designed to withstand high pressures, was tested at Ottawa. A honey of high density (16.5 per cent moisture) was heated to 176°F. and cooled to 85°F. in continuous operation. Operating pressures in this test were well below the maximum specified for the unit.

The advantages of this type of equipment are that it can readily be dismantled and cleaned and can be expanded or contracted to suit the volume of honey to be processed.

BEHAVIOR OF HONEYBEES

MATING RANGE OF QUEEN BEES

Studies were undertaken in a bee-free area to determine the maximum distance required for controlled natural mating of queens. Droneless nuclei containing genetically-marked virgin queens were established at 4, 6, 8, 10, and 12 miles from a group of colonies stocked with genetically-marked drones.

Matings were obtained in queen colonies separated from the drone colonies to a distance of 10 miles. Beyond 6 miles the frequency of mating declined. No matings were obtained beyond 10 miles. These results suggest that, in order to obtain pure matings, the distance separating breeding apiaries should be at least 8 to 10 miles.

QUEENS MATE SEVERAL TIMES

An experiment was undertaken to determine the number of matings which usually occur in the lifetime of queen honeybees. Two drone populations were used: the wild type (Italian) and the cordovan-marked hybrid.

Out of 164 queens mated in one experiment, the offspring of 98 per cent of the queens showed both cordovan and normal type workers. Direct evidence has been obtained that queens mate at least twice and the probability is that they mate approximately seven times on the average.

HONEYBEES SHOW PREFERENCE FOR SUGAR SOLUTIONS OF HIGH CONCENTRATIONS

In studies with small colonies established in a screened house, bees were trained to collect sugar solutions which contained mixtures of sucrose, glucose, and fructose. The concentration of the solutions were varied within the range of 20 to 50 per cent. The bees preferred 50 per cent to 45 per cent, and 45 per cent to 40 per cent. When the difference in concentration between sugar solutions was narrowed from 5 per cent to 2.5 per cent, there was no difference in the number of bees feeding from the dishes.

CEREAL CROPS

BREEDING AND TESTING

SPRING WHEAT

Selkirk leads in rust area.—The rapid increase in the use of Selkirk wheat in the rust areas of Manitoba and eastern Saskatchewan during 1955 was remarkable. It occupied 3 per cent of the Manitoba wheat acreage in 1954, the year of its release, but in 1955 it occupied 64 per cent. The satisfactory performance of Selkirk on irrigated lands of southern Alberta resulted in its being recommended for that area.

Search for better durum wheats intensified.—Tentative plans had been made to release two new durum wheats during 1955-56 in the rust areas of Manitoba and eastern Saskatchewan. Since they did not measure up in the final analysis to all quality characteristics necessary for the top grades of Amber durum wheat, they were not distributed. Other promising material from newer crosses was advanced as rapidly as possible. Plans were made to increase, in Canada, two new durum wheats released in North Dakota, namely, Ramsey and Langdon. Plans were made to intensify breeding and research on durum wheat.

OATS

New varieties are very successful.—There was much interest in Rodney and Garry oats during 1955. Both varieties have shown wide adaptability and are in demand, particularly in the rust areas of the West and in parts of Ontario and Quebec. Garry is also in great demand in the north-central and north-eastern areas of the United States.

Abegweit has spread rapidly into New Brunswick from Prince Edward Island where it was originally distributed. It is recommended in parts of Quebec and shows great promise as a new variety for the Peace River area of Alberta.

Scotian, released in Nova Scotia in 1954, has shown adaptability outside the province and in recent tests appears to be high yielding in other areas of Eastern Canada.

A new early-maturing oat being increased.—A new early-maturing oat, developed at Ottawa and reselected at Kapuskasing, was increased in 1955. It has very good resistance to leaf and stem rust. It is expected that a licence for this variety will be requested during 1956 and seed made available to growers in 1957, particularly in northern and eastern Ontario. Its parentage involves the varieties Roxton and Ajax along with rust-resistant hybrid lines. It is designated at present as hybrid number 3928.

A new hulless oat licensed.—Vicar, a new hulless oat variety was licensed for sale in Canada. It originated as a selection from the hulled variety Garry. It has excellent resistance to the rusts and smuts. It has strong straw and, for a hulless oat, it produces excellent yields. It is a late maturing variety.

U.S. variety Clintland licensed in Canada.—Clintland was released in the midwestern United States in 1954. It has performed well in southern and southwestern Ontario and has been released in Canada as a replacement for Clinton. It is higher yielding than Clinton and has greater resistance to crown rust. Its parentage involves the varieties Clinton and Landhafer.

Wild species provide disease resistance.—Extensive tests have shown that wild species, such as *Avena strigosa* and *A. brevis*, provide new sources of disease resistance. This is true for the rusts and for the Septoria disease which has increased greatly in Eastern Canada during recent years. New crossing procedures have been developed to move the desirable characters from the wild species to common oats.

BARLEY

Parkland, a new malting variety.—Nearly 10 million acres of barley were planted in Canada in 1955. The attention given to barley by farmers, industry, and plant scientists during recent years has been a highlight of cereal development in Canada. The new variety, Parkland, developed at Brandon has been licensed. It is a smooth-awned, rust-resistant, high yielding and widely adapted variety. It is equal to Montcalm in malting quality and superior in yielding ability and strength of straw. Parkland is the first malting barley developed, by breeding, in the Experimental Farms Service. Only one other malting variety has ever been bred in Canada, namely, Montcalm from Macdonald College, Que.

A new early-maturing barley being increased.—A new early-maturing feed barley, selected at Kapuskasing, was increased in 1955. It is expected that a licence for this variety will be requested during 1956 and seed made available to farmers in northern Ontario in 1957. It does not appear to be suited to other areas. Its parentage is Montcalm \times Olli and it is designated as K.4061-8.

The Swedish two-rowed variety, Herta, licensed.—The Swedish variety Herta was licensed after extensive testing throughout Canada. It has yielded well, particularly in some areas of Manitoba, when compared with the popular two-rowed variety, Hannchen. Herta has good straw and does not shatter readily. It is not a malting barley in Canada.

Hybrids carry resistance to jointworm.—Resistance to barley jointworm (*Harmolita hordei*) has been located and transferred to agronomically desirable hybrid lines at Charlottetown. One of the best sources of resistance is the variety Mianwali. New jointworm-resistant barleys will enter advanced yield tests in 1956.

New types of winter barley obtained.—A rare interspecific cross, *Hordeum leporinum* × *Hordeum vulgare* has produced new types of barley plants which have shown some winter hardiness when grown at Ottawa. This material is valuable for breeding purposes. Some of these new barleys were tested in Ontario, British Columbia, and the United States during the winter of 1955-56.

FIELD BEANS

Increased interest in growing beans.—Interest in this crop has increased in New Brunswick, Manitoba, and the irrigated areas of Alberta. Following years of testing at Fredericton, the early maturing white-seeded variety, Lapin, was licensed. A preliminary study to determine the quality of southern Alberta field beans for canning purposes indicated that Burbank, the recommended variety, was superior to other white-seeded varieties. Consideration has been given to seed size in relation to processing.

WINTER RYE

European varieties best in Eastern Canada.—Many varieties and introductions from European plant breeding stations were tested in uniform tests in both Western and Eastern Canada. Dominant, a variety developed in Holland, gave the best yield in Eastern Canada. Dakold and Antelope, both north American varieties, have proved reliably winter hardy in Western Canada.

Tetra Petkus, a tetraploid variety produced in Germany and licensed for sale in Canada in 1954, was tried on many farms in Eastern Canada. Its performance in Ontario has been very satisfactory. It is a coarse variety with stiff straw and large kernels. It does not have sufficient winter hardiness for prairie conditions.

USE OF GROWTH CHAMBERS

Moveable, self-contained chamber developed.—A new type of plant growth chamber has been developed at Winnipeg. The outside dimensions are 5 by 11 by 8 feet. The complete chamber, including controls, operates as a single unit. The units can be readily manufactured. Tests have proved that the chambers are completely satisfactory for growing cereal plants under controlled conditions and with rapidity. It is expected that they will be of great use to cereal breeders.

MEASUREMENTS OF QUALITY

FLOUR

New mixer expedites quality testing.—A small laboratory mixer capable of mixing five-gram flour doughs was developed. The work was done in connection with studies on prediction tests for wheat quality evaluation.

SEED PRODUCTION

NEW VARIETIES

Experimental Farms aid in distribution.—Several Experimental Farms produce and distribute pedigreed seed of the newest varieties each year. This applies mainly to varieties that have not entered commercial production on an especially large scale such as was the case in 1955 for Garry and Rodney oats in most areas of Canada, Abegweit oats in the Peace River area, and Wolfe barley in central Alberta. The greatest effort was with Selkirk wheat when a second distribution was made in 1955. Sufficient seed was distributed to meet all requirements for 1956 seeding. Lake, a hard red spring wheat developed at Scott was distributed to farmers during the past two years. There was a good demand for seed and the variety is recommended for nine zones in central and northwestern Saskatchewan. Vantmore barley, a replacement for Vantage in Manitoba was increased on Experimental Farms in Manitoba and eastern Saskatchewan during 1955 and distributed during the fall. Raja flax was distributed in Western Canada during the spring of 1955. This variety has been well received both in Canada and the United States as an addition to the early-maturing varieties. The demand for seed was keen and a second distribution was made during the winter of 1955-56. Seed of the new hardy winter wheat variety Richmond was distributed in 1955, mainly in eastern Ontario.

Seed of promising selections increased.—Several Experimental Farms also produced seed of unlicensed or unnamed varieties prior to a final decision on whether or not they should be licensed for sale in Canada. Two rust-resistant durum wheats, D.T. 136 and D.T. 137, which had potential variety status were increased on a fairly large scale. The new malting barley variety, Parkland, from Brandon was increased on five Experimental Farms during 1955. Three United States durum wheat varieties not licensed in Canada, namely Sentry, Langdon, and Ramsey, were increased in Western Canada.

Procedure for increasing and distributing new varieties clarified.—The procedure whereby the Canada Department of Agriculture distributes seed of new cereal varieties to farmers was reviewed and revised during the year. The Department will continue to administer all details in connection with the increase and distribution of new varieties. A Cereal Seed Office for Western Canada has been established in Winnipeg. The officer in charge will work closely with Branch Farms and all interested groups in seeing that seed of new varieties is increased efficiently and in sufficiently large volume to enable a fair and equitable distribution to be made to all interested farmers in the area for which the variety is recommended.

FIELD HUSBANDRY, SOILS AND AGRICULTURAL ENGINEERING

AGRICULTURAL ENGINEERING

FARM BUILDINGS

Horizontal silo construction important.—Investigations on horizontal silos have been conducted at Ottawa, Kapuskasing, Lennoxville, and Kentville. These tests included a study of designs and materials for side walls, floors, roofs, supporting posts, and feeder gates. Results indicate that two-inch tongue and grooved lumber is one of the best side wall materials, that floors require a lateral slope from the middle to the sides, and that roof protection is desirable in many parts of Canada. According to a survey conducted in 1955, over 2,000 horizontal silos are now in use on farms.

Efficiency in dairy cattle and sheep barns saves labor.—Floor plans for dairy cattle and sheep barns are being developed on the basis of arrangements for the efficient use of labor and the utilization of new types of livestock equipment. These plans are being reviewed by livestock specialists on items relating to management and facilities for handling milk and feed. Drawings for stall-type dairy barns have been completed and plans for sheep barns will be completed in 1956.

TRACTOR MAINTENANCE INCREASES POWER, SAVES FUEL

The horsepower of tractors decreases most rapidly during the first 700 hours of use, according to data collected at Swift Current. In this period of use, the loss of horsepower may be as much as 10 to 12 per cent. By grinding valves and minor adjustments, most of this horsepower can be restored to the motor.

TILLAGE, SEEDING, AND HARVESTING OPERATIONS

Deep tillage requires considerable power.—According to tests conducted at Swift Current and Ottawa, a single cultivator chisel operating at a depth of 18 to 20 inches in clay loam soil requires about 25 drawbar horsepower. Approximately the same power will draw a five-tooth chisel cultivator in sod when it is gradually worked down to a depth of 6 inches.

Chisel cultivator places fertilizer deep.—In a project on deep tillage, a combination chisel unit was used for the deep placement of fertilizers. In field tests, this type of equipment satisfactorily placed fertilizers in a vertical band at a depth ranging from 12 to 18 inches.

Packing does not increase yields.—At Swift Current, six machines were compared for packing land in combination with a one-way disk seeder. The machines used in this test included a straight disk, a drag harrow, crowfoot, modified crowfoot, spiral and vee-type packers. There was no appreciable difference in yield resulting from the use of different types of packers in 1953 and 1954. Packing did not give a significant difference in yield over unpacked check areas. All of the packers operated satisfactorily under field conditions on clay loam soil.

Blade cultivator most satisfactory for seedbed preparation.—At Lethbridge, a one-way disk packer, hoe drill, press drill, and blade unit with packer were compared in seeding operations on stubble land. On the basis of a four-year average, the use of these four types of machines gave no significant difference in yield. When a chisel plow, one-way disk, and blade cultivator were used prior to these seeding operations, the blade cultivator gave a significantly higher yield than the chisel plow and a slight increase in yield over direct seeding.

Shredder-type forage harvester provides good silage.—In a project on equipment for harvesting forage crops, a shredder-type machine was compared with standard forage harvester units. Examination of the chopped material showed that the length of chopped material from the shredder averaged 4 to 5 inches, while the standard cutting machine at a setting of 2 inches produced material with a length of $\frac{1}{2}$ inch to 6 inches. When placed in a horizontal silo, both materials were packed and stored successfully.

Surface drains remove excess water effectively.—Investigations of surface drainage demonstrated that surface water can be effectively removed from flat land. When surplus water was removed by land levelling and very shallow ditches, seeding on loam soil was five to ten days earlier than on undrained areas. Surface drainage cost about one-fifth as much as tile drainage and this did not include the cost of outlet ditches for tile. Surface drainage may be applicable to many thousands of acres of land in Eastern Canada.

Experimental plot thresher proves useful.—A special thresher for plot operations has been developed at Saanichton. This machine was specifically designed as a self-cleaning unit which is essential in threshing samples from plots used for developing different varieties of seed and in all plot operations where accurate yields are required. It is being constructed for Branch Farms and will be used extensively in various plot operations.

AGRICULTURAL METEOROLOGY

EVAPORATION MEASUREMENTS INDICATE IRRIGATION NEEDS

Evaporation measurements have proved useful in determining when and how much to irrigate. A simple method of budgeting irrigation water for pastures based on evaporation measurements was compared with the electrical resistance block method of determining soil moisture. During the dry summer of 1955, at Ottawa, the black Bellani atommeter used for measuring evaporation called for 14 one-inch irrigations and the use of the resistance blocks called for 15 such irrigations. A deficit of $1\frac{1}{2}$ inches available moisture, below field capacity, was allowed in each case prior to irrigation.

MULTI-POINT RECORDER FOR MEASURING SOIL AND AIR TEMPERATURES

Extreme temperature variations within a wheat crop were measured at Ottawa over a profile from 12 inches in the soil to 5 feet above the soil. On one occasion, soil surface temperature in the sun was 122°F . while at 5 feet the air temperature was 78°F . The multi-point recorder used for the measurements was designed and constructed at the Central Experimental Farm for measuring temperature profiles in various crops under different treatments in the field, where hydroelectric power is not available.

SHELTERBELTS REDUCE WIND SPEED AND CONSERVE MOISTURE

The microclimate in the vicinity of field shelterbelts has been studied at Swift Current. On the leeward side of shelterbelts and hedge rows, wind speed was reduced for a distance of 20 times the height of the trees, soil drifting was reduced to very mild shifting, snow accumulation was increased, and soil moisture increased. Evaporation, on the other hand, was decreased by only a very small amount.

FIELD HUSBANDRY

STUDIES WITH SILAGE

Plastic cover on soils reduces the top spoilage.—Recent studies with various covers or seals for horizontal silos showed that a plastic tarpaulin covering, held in place with straw or hay, resulted in practically no surface spoilage. Losses were observed only at the open ends of the silo and these were minor. However, in order to preserve the plastic tarpaulin for further use, it was

found necessary to remove this covering in late fall prior to continuous freezing temperatures and snowfall. In wintery conditions, the plastic material became quite brittle and froze to the surface of the silage and was easily torn while being removed.

Spoilage to a depth of 2 to 4 inches occurred on the surface of these silos when wetted sawdust, long hay, or straw were used as covering material. Uncovered silos had a spoiled layer ranging from 5 inches to 1 foot in depth.

Hay baler for ensiling forage gave only fair results.—The use of the hay baler for harvesting forages for silage purposes has been investigated in preliminary tests. This equipment handled the green crop quite successfully in the field but considerable difficulty was encountered at the horizontal silo in unloading and in compacting the bales sufficiently to provide a high quality feed. Further testing of this technique is required before it can be recommended.

Silage losses are reduced by increased compaction.—The relation of density or compaction of the silage mass to silage losses from fermentation and spoilage was investigated in half-ton steel tanks. A legume-grass mixture of uniform moisture content was ensiled at three different degrees of density by means of a hydraulic press. The silos were sealed with a plywood grid cover. Spoilage and fermentation losses were progressively reduced as the density was increased. Silage compacted to a density of 15 pounds per cubic foot had a total loss of 43.2 per cent compared with total losses of 30.9 and 17.5 per cent for silage with densities of 30 and 40 pounds per cubic foot, respectively. In a free-choice palatability trial, Holstein heifers showed a marked preference for the compact silages.

WEED CONTROL RESEARCH

MCP less harmful to crops than 2,4-D.—Enough data have now been accumulated to evaluate the relative merits of MCP and 2,4-D under conditions in the Prairie Provinces. Injury from either herbicide was negligible when wheat or barley was sprayed from the fourth leaf stage to early flowering stage. On the other hand, oats and flax were much more tolerant to MCP than 2,4-D at this time. Thus, MCP can now be recommended for spraying during this critical period unless the weeds present happen to be resistant to this herbicide. The relative susceptibility of most of the common weeds to these two compounds is now known.

Preplanting applications of chemicals kill some weed seeds.—Preplanting applications wherein chemicals are mixed into the top 2 to 4 inches of soil some time before the crop is planted have been tested for several seasons. The purpose is to kill the weed seeds in the soil and allow sufficient time for the degradation of the herbicide before the crop is sown. This waiting period is particularly important if the crop plants are susceptible to injury by the chemical. An intensive program is now being conducted in screening new herbicides which control wild oats in this way.

Applying chemicals before plowing controls perennial weeds economically.—Another method of application that has been developed is to apply the herbicides to perennial weeds 10 to 14 days before the area is plowed or disked for seedbed preparation. This method may not lead to the immediate eradication of the weed but, at least, regrowth from the roots can be inhibited enough so that a crop can be produced without undue competition from the weed.

Preliminary trials have shown that relatively low amounts of some herbicides are effective in this respect and do not injure the following crops. Previous methods for chemical control of perennial weeds usually have been very expensive and often have left the soil sterile and unproductive for several seasons.

SOIL MANAGEMENT

WATER UTILIZED MORE EFFICIENTLY ON FERTILE SOIL

Studies at Ottawa show that soil water is used more efficiently by crops that are fertilized as compared with the unfertilized ones. An inch of water added to a fertilized oat crop produced almost twice the yield of an inch applied to an unfertilized crop. At Swift Current, range grasses responded well to nitrogen fertilization without additional water. Yield increases from 33.5 pounds of nitrogen per acre ranged from 100 to 300 per cent.

TRASH COVER NOT HARMFUL TO WHEAT YIELDS

At Lethbridge, stands of winter and spring wheat were not decreased by trash cover. Normal amounts of cover delayed maturity slightly but did not decrease yields significantly. The trash cover was found to decrease soil temperature to a depth of about 8 inches. The decrease was 0.6° F. for each 1,000 pounds per acre cover.

ANHYDROUS AMMONIA GOOD SOURCE OF NITROGEN

Anhydrous ammonia was compared with ammonium nitrate and ammonium sulphate applied to stubble for spring wheat in Alberta's Dark Brown soils, and at Ottawa, and were found to be equally beneficial. The wheat responded to applications of 60 pounds of nitrogen per acre for each source with increases of about 14 bushels per acre. Anhydrous ammonia has been found to be a good source of nitrogen for most crops in Canada. For row crops, it is usually desirable to bandplace the anhydrous ammonia near the seed in the same way the dry fertilizers are banded.

FALLOW WHEAT BETTER THAN STUBBLE WHEAT

Wheat yields on fertilized Brown soils in off-station tests out of Swift Current were much better following fallow than stubble. There was greater response to the additions of nitrogen on the stubble but, even at the highest rate, there was still yellowing and reduction in yield.

CORN CAN BE GROWN CONTINUOUSLY

Under good fertilization practices, corn has been grown continuously at Woodslee for five years. Yields from fertilized plots have been more than double those from the unfertilized plots.

LIME AND PHOSPHORUS ARE GOOD INVESTMENTS

At Ste. Anne de la Pocatiere, lime applied to hay along with superphosphate increased the net return to \$89.20 per acre from \$32.25 where lime was not applied. Total return and yield increases with Reno and Aero Phos, two recently introduced commercial rock phosphate materials, were not so great as with superphosphate.

FALL PLOWING GOOD FOR POTATOES

Fall plowing of sod in Prince Edward Island resulted in as high yields of potatoes as spring plowing. This is important since delay in planting in the spring can limit yields.

POTASSIUM SULPHATE BEST FOR POTATOES

Potassium sulphate and potassium chloride, the most common sources of potassium in mixed fertilizers, were compared at Ottawa as to their effects on yield and dry matter percentage. The sulphate-treated plots yielded better than the chloride and produced tubers higher in percentage dry matter.

SOIL SURVEY

RECONNAISSANCE SURVEYS

Soil surveys were conducted in all provinces in co-operation with the provincial Departments and Colleges of Agriculture. Major efforts were directed to the continuation of the systematic reconnaissance soil surveys which provide basic soil information for sound land use. During the field season, a total of approximately 4.5 million acres was mapped. These surveys were conducted in the following areas: Musgravetown area of Newfoundland; Inverness County, N.S., parts of Victoria and Madawaska counties, N.B., Lake St. John areas and L'Islet, Bellechasse, Maskinonge, St. Maurice, and Labelle counties of Quebec; Parry Sound district and Hastings, Lennox and Addington, Oxford, and Simcoe counties of Ontario, the West-Lake and Inter-Lake areas of Manitoba; Kindersley Municipality, Saskatchewan; the Edmonton and Beaverlodge districts of Alberta; and the northeastern section of the Peace River Block and parts of the Kettle Valley of British Columbia.

DETAILED SURVEYS

Detailed surveys were made of some 160,000 acres of land in Saskatchewan and Alberta in areas that have been proposed for irrigation purposes. These surveys provide valuable information for rating the soils with regard to their suitability for irrigation. Detailed surveys have also been made of some 4,000 acres of land in connection with soil research and other agricultural investigations on a number of Illustration Stations, Experimental Farms, and College Farms.

EXPLORATORY SURVEYS

Exploratory or preliminary soil surveys of areas in the vast unsettled parts of Canada have been carried out for some years as time and means permitted. The major obstacle to carrying out these surveys lies in the difficulties of travelling within the areas being examined and, while the use of aerial photographs has greatly facilitated such surveying, examination of the soils in the field is still necessary in order to obtain reliable information. Areas explored in 1955 were the western part of the Peace River region in British Columbia, which was covered by means of pack horses; and the Slave River Lowlands in the Northwest Territories which were examined by means of canoe and foot traverses along the Little Buffalo and Slave Rivers. Soil examinations of a few remote areas in northern Manitoba were made after reaching these areas by seaplane.

SURVEYS BY HELICOPTER

A new way of transporting soil surveyors in remote areas was tried out for the first time when the Alberta Soil Survey explored about 10 million acres in the west-central part of the province by means of helicopter. This experiment proved quite successful in that surveying was carried out much more rapidly and more economically than would have been possible by any other method of transportation.

FORAGE CROPS

BREEDING AND TESTING

INBRED LINES OF CORN SHOW STALK-ROT RESISTANCE

The incidence of stalk-rot in corn has been steadily increasing throughout southwestern Ontario during the past six or seven years. The disease is most noticeable as the corn plant approaches maturity. Badly infected stalks break over close to the ground thus making the harvesting of the crop with mechanical pickers very difficult. Also, since many of the ears come in close contact with the ground their chances of rotting are increased.

The disease is soil borne and, so far, the use of resistant hybrids seems to be the only practical mode of control. This method of approach has been strongly emphasized in the corn breeding program. To date, there are two highly resistant corn inbred lines at Harrow. One of these, CH9, is a product of the Harrow breeding program. The other line, B14, was developed at the Iowa Experimental Station. These two inbred lines are being used as parent material in a breeding program designed to develop superior hybrids that will be resistant to the stalk-rot disease.

NEW CORN HYBRID LICENSED AND RELEASED

Canbred 235, an early maturing yellow dent hybrid developed in the corn breeding program at Ottawa, was licensed and released for commercial production under the name Pride K5.

GENETIC, CYTOGENETIC, AND PHYSIOLOGICAL RESEARCH

MOLYBDENUM INCREASES RED CLOVER YIELDS

The plant nutrient, molybdenum, was shown to be a limiting factor in the production of red clover at Charlottetown. In 1954 and 1955, red clover seed was treated with sodium molybdate and ammonium molybdate at rates from 5 to 20 ounces per acre. There was little difference in average yields between treatments, 5 ounces per acre giving a response comparable with that from 20 ounces per acre. Plants on the treated plots were larger, darker in color, and had a much more healthy appearance than untreated plants. The average increase in yield was found to be approximately 1,300 pounds of dry matter per acre or a 55 per cent increase due to the molybdate applications. These tests were conducted on land having a pH value of 6.2.

MINERAL TOXICITY CONTRIBUTES TO THE FAILURE OF ALFALFA IN ACID SOILS

Manganese and aluminum toxicities were found to curtail the luxuriant growth of alfalfa on acid Quebec soils. They decreased the rate of growth, depressed the yield, and ultimately led to death.

Greenhouse trials in nutrient solutions indicated that all varieties did not behave in the same manner. The toxicity symptoms which appeared after the second cutting were more acute and were accompanied by greater damage in some varieties than in others.

Results of these investigations indicate that the tolerance of alfalfa to an excess of manganese is dependent upon the rate of translocation of that element from the roots to the aerial parts of the plant. Strains of alfalfa are most tolerant whenever a high percentage of the manganese absorbed by the plant remains in the roots.

CHEMICAL "FROSTING" DID NOT HASTEN CORN DRYING

Interest in the chemical "frosting" or desiccation of corn foliage to hasten ear drying was stimulated in southwestern Ontario last fall when a product for this purpose was offered to the farmers.

In a test at Harrow, ammonium nitrate solution and potassium cyanate were used at various rates per acre to desiccate or "frost" the corn foliage when the moisture content of the grain was 39 per cent or less. It was found that both chemicals gave excellent foliage kill at all rates. Periodical moisture determinations showed that $3\frac{1}{2}$ per cent was the greatest difference between the moisture content of the untreated corn and that of the treated corn. This occurred when the moisture content of the grain was in the neighbourhood of 30 per cent. As the moisture content dropped below 20 per cent, the pendulum swung in favor of the untreated corn by as much as 3 per cent. There appears to be no reason to believe that the chemical "frosting" or desiccation of the corn plant will sufficiently speed up the rate at which the corn grain loses moisture to justify the use of desiccants.

MALEIC HYDRAZIDE REDUCED THE YIELD OF SUGAR FROM SUGAR BEETS

Two years data show that the application of maleic hydrazide, a growth-regulating substance, as a foliar spray to sugar beets reduced the total yield of sugar per acre. As compared with the untreated control plots, the treated plots showed a reduction in the yield per acre of both beets and tops but an increase in the percentage of sugar in the beets. The increase in sugar content, however, was not sufficient to compensate for the loss in yield of beets and, as a consequence, the highest yield of sugar per acre was secured from the control plots.

HAY AND PASTURE

NORTHERN STRAINS OF BROME GRASS PROVE SUPERIOR TO THE SOUTHERN STRAINS

The evaluating of strains of brome grass for the "park belt" area of the Canadian Prairies during the five-year period, 1951-55, has clearly demonstrated the superiority of northern strains over strains of southern origin. The northern strains as a group produced 13 per cent more forage and 84 per cent more seed. They also grew three to four inches taller than the southern strains and produced approximately 15 per cent more regrowth following cutting for hay. At the conclusion of the tests, plots of southern brome grass strains showed decided lack of vigor and were badly infested with dandelions and Kentucky blue grass while those of northern strains were vigorous and practically free from weeds and other grasses.

Three of the more recently developed northern varieties, Manchar, Martin, and Western Iowa, showed particular promise. Each of them produced significantly higher yields of hay than Northern Commercial, and Western Iowa was an outstanding seed producer.

HIGH YIELDING MIXTURE FOR IRRIGATED PASTURE

On the basis of yield of dry matter, rapidity of recovery, ability to grow in combinations with other grasses and legumes, and to withstand encroachment of weeds, four mixtures were selected from twenty-four tested in southern Alberta over a five-year period. These four mixtures have since been grown in large pastures and have been tested under actual grazing conditions.

Of the mixtures tested, the most suitable one for general pasture purposes is composed of:

Orchard grass	7 parts
Brome grass	7 parts
Creeping red fescue	4 parts
White Dutch clover	2 parts

This mixture was seeded at the rate of 20 pounds per acre.

TEST OF BRITISH GRASSES

During the past three years, British strains of timothy, orchard grass, tall fescue, and perennial rye grass have been tested at 17 Branch Farms to determine their suitability for hay and pasture purposes under diverse climatic conditions. In these tests, particular attention was paid to winter hardiness and yield.

In Eastern Canada and British Columbia where timothy is widely grown, the British strains of timothy did not suffer from winter injury. British strains of orchard grass possessed varying degrees of hardiness but the Canadian variety Hercules showed the best survival. The perennial rye grass strains survived well in British Columbia but winterkilled badly elsewhere. The British tall fescue strain proved quite hardy at all locations.

HIGH YIELDING RED CLOVER

Lasalle red clover is a new double-cut variety produced by blending seed of the old varieties, Dollard and Ottawa, at the foundation stock level. In tests for hay at fifteen locations across Canada, this variety gave an average yield of 8.4 per cent better than commercial sorts. Besides yielding well, Lasalle has demonstrated superiority in winter hardiness and moderate resistance to Sclerontinia crown rot, northern anthracnose, and powdery mildew. It is adaptable to all regions of Canada where double-cut types of red clover are grown.

The superiority of Lasalle in yield, as compared with commercial sorts, is even greater if carried to the second crop year. Experimental data indicate as much as 45 per cent increase in the second crop year due largely to the greater persistence of the Lasalle variety.

NEW ALFALFA VARIETIES DO WELL IN WESTERN CANADA

Interest in new alfalfa varieties has focussed on two productions, one from the United States and one from Canada. Vernal was selected at the University of Wisconsin and licensed for sale in Canada in 1954. It is highly resistant to bacterial wilt and, in Western Canada, equals Ladak and Grimm in winter hardiness and surpasses Grimm in forage yield. Rambler was licensed in 1955 and was released by the Experimental Farm, Swift Current. It was developed for its ability to withstand trampling and grazing, to spread by underground rootstocks, and for its resistance to drought. Results obtained showed that, in total forage yield, Vernal headed the list with Rambler a close second. Rambler appears to be admirably suited to those drier prairie areas that depend on a single cutting and where the wilt disease is not an important factor. Vernal is recommended particularly for irrigated land and for districts where moisture conditions ensure at least two cuttings and where bacterial wilt may be a hazard. It is also a potential variety for seed growers who would like to grow a wilt-resistant variety for export to the United States.

SEED PRODUCTION

TREFOIL GROWN IN ASSOCIATION WITH GRASSES GIVES REDUCED SEED YIELDS

Results from a two-year test indicate that higher yields of birdsfoot trefoil seed will be obtained when the species is grown alone. Average yields of 113 pounds per acre were obtained from the pure trefoil plots as compared with 99 pounds for a trefoil—red fescue mixture, 64 pounds for a trefoil—timothy mixture, and 30 pounds for a trefoil—brome mixture. Brome grass, in particular, suppressed the growth of trefoil very appreciably and, as a consequence, seed yield was seriously affected.

Where seeding in mixture with a grass is considered necessary for weed control, it would appear that creeping red fescue offers the best possibility. If a mixed trefoil—grass association is required for pasturing purposes, then a trefoil—timothy combination can be used with some sacrifice of seed yield.

NEW VARIETY OF CRESTED WHEAT GRASS

Summit, a recently licensed high-yielding variety of crested wheat grass, was developed at the Forage Crops Laboratory, Saskatoon. It is expected that at least 200,000 pounds of registered seed of this variety will be available for distribution by the fall of 1957.

HORTICULTURE

BREEDING AND TESTING

NEW APPLE VARIETY

An apple seedling originated at Morden has been named Goodland. This variety is an open-pollinated seedling of Patten Greening, a moderately vigorous grower, an annual bearer, and is moderately productive. Goodland ripens in mid-September and keeps well until the end of the year.

OUTSTANDING RASPBERRY INTRODUCTIONS

Two Ottawa raspberry introductions, 0-382 and 0-383, have been named Carnival and Comet, respectively. Carnival is a selection from the cross Ottawa \times Rideau and ripens with Latham but is superior to that variety in fruit size, firmness, and quality. Comet is an Ottawa \times Madawaska seedling that ripens two or three days earlier than Carnival. At Charlottetown, it has proved to be very desirable from the standpoint of quality, hardiness, and yield. It has been on trial with growers for a number of years and has had good reception.

PROMISING STRAWBERRY SEEDLINGS

Several Agassiz strawberry originations, still under number, have been distributed to growers and testers throughout the lower mainland of British Columbia. Strawberry seeding No. 53 showed up particularly well on the heavier soils. This seedling appears promising since this area of the province is in need of a variety suitable for the heavier types of soil.

FERGUSON, A NEW TOMATO VARIETY

An Ottawa tomato selection has been named Ferguson. This variety has had widespread trial in growers' fields throughout Ontario under number Ottawa TO-17 and has shown superior performance in comparison with such standard varieties as John Baer, Longred, and Gardenstate. It is a selection from the cross Bounty \times Early Rutgers made in 1941, and is superior to the standard varieties in yielding ability and resistance to cracking.



Parkland is a nodding Manchurian-type barley. Shown at right is spikelet group with front and back views (inset).

PARKLAND—A New Malting Barley

Parkland, a six-rowed, smooth-awned, blue aleurone malting variety was developed at the Experimental Farm, Brandon, through the co-operative efforts of plant breeders, plant pathologists and cereal chemists. This new variety was derived from a series of crosses, initiated in 1939, involving the parental varieties Newal, Peatland, Olli, Montcalm and O.A.C. 21. Parkland (designated as "Br. 3833" during the testing period) is rust resistant and has better than average lodging resistance. It is a variety that is widely adapted in the prairie provinces, especially the eastern prairies, and on the average, has exceeded Montcalm by 12 per cent in yield.

In view of the great demand for a new malting variety, four thousand bushels were produced on Experimental Farms in 1955, the final year of testing. The variety was licensed for sale in Canada in March, 1956. The Canada Department of Agriculture increased Parkland under contract during the summer of 1956 and approximately 200 thousand bushels will be distributed to growers in time for spring planting 1957.

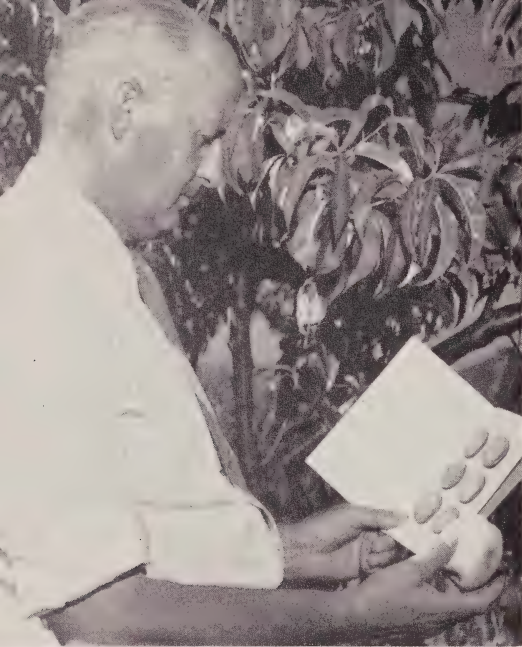
AGRONOMIC DATA FROM TESTS IN WESTERN CANADA—AVERAGE 1953-1955.

Variety	Yield per acre	Wt. per bushel	Height	Resistance to lodging	Days to mature	Stem rust*
	bu.	lb.	in.			%
Parkland.....	51.3	50.8	36.2	good	98.2	1
Montcalm.....	45.7	49.4	36.2	fair	97.9	53
O.A.C. 21.....	43.7	48.7	36.5	fair	96.9	37

*Data from tests at the University of Saskatchewan.

Left: Cereal breeders inspecting Foundation stock lines of Parkland in breeding nursery at Brandon, Man. *Right:* Parkland (left) shows more lodging resistance than Montcalm (right).





Food Techn

The Horticulture Division conducts food to Summerland, B.C., Lethbridge, Alta., Morden, Ma insight into some of the projects being carried on a

Upper left: At Summerland "uniform maturity found, for example, that Vee peaches for canning canning ripeness. In a co-operative effort, a Mat Fruit Committee of B.C. Tree Fruits Ltd. with color by technologists at the Summerland laboratory. Manual should be used. The Maturity Manual wh prepared as a guide for harvesting apricots, cherrie Since the processing outlet takes about one-third of that fruit be harvested in a manner acceptable to

Middle left: At Kentville experiments are un expressed by hardness to yield and processing qu texturemeter, is measuring the hardness of the peas studies have shown that optimum processing quali meter reading approximating 95-100 units.

Lower left: The Horticulture Division's food and Marketing Services of the Department. Here tomatoes with a canning inspector and a bacteriolo

Lower left center: Many new experimental orchards. Food technologists prepare applesauce sauce apples.

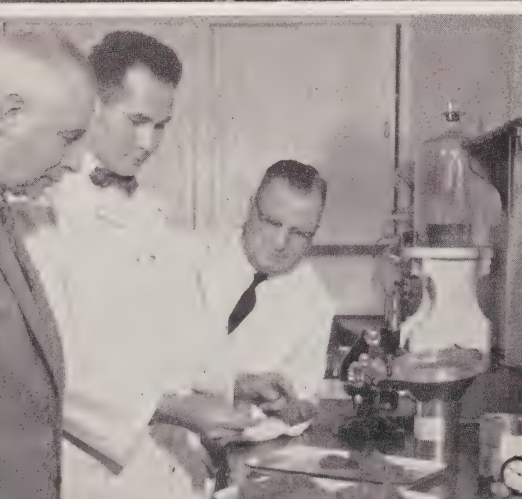
Lower right center: At Ottawa experiments h skin of apples without a large waste loss. Using successfully reduced peeling losses by employing hi **Inset:** Large amount of hand peeling (right) had temperature furnace had a peel waste of only 3%.

Lower right: The flavor of canned apple juice measuring the amount of flavor in apple juice are photo, the food technologist is steam distilling vola

Middle right: At Morden considerable intere variety developed on the Morden Experimental Farm economist make up taste panel to rate flavor of the intense color and a larger percentage of whole fruit

Lower inset: Food technologist operating a labor sample from the "Manitoba".

Upper right: At Lethbridge, the food technolo could be reduced considerably without loss of quali accomplished by reducing the time required for p mining the hardness of a soaked bean, using a penet those which have received (1) no pre-treatment an soak, and (3) three minutes in 170°F. water and a recommended.



ogy Studies

ology investigations on Experimental Farms at Ottawa, Ont., and Kentville, N.S. Photos give an various laboratories.

fruit for processing" has come in for study. It was the best quality if harvested 6 to 8 days from the peak of maturity. A Manual was published last year by the Cannery Division and accompanying information being compiled to show food technologists demonstrating how the fruit is sold to growers to supply to their pickers has been prepared. Peaches and prunes for fresh and processing outlets. On Okanagan stone fruit and pear crop, it is important to select the best processors.

way to study the relationship between maturity as determined by color in canning peas. The food technologist, using a color scale is used to determine the yield per plot. The color will be obtained if peas are harvested with a texture-

Food technologists work closely with officials in the Science Division. A food technologist discusses color variation in canned

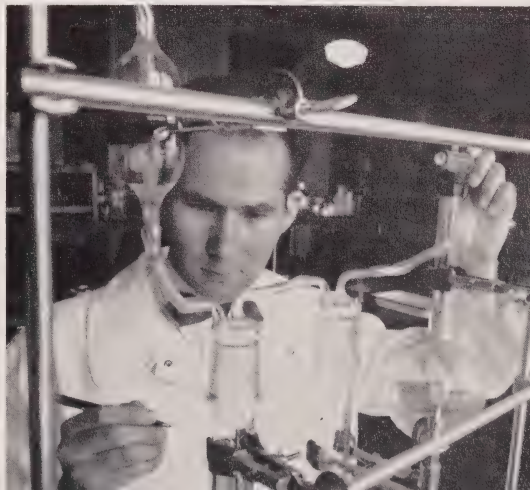
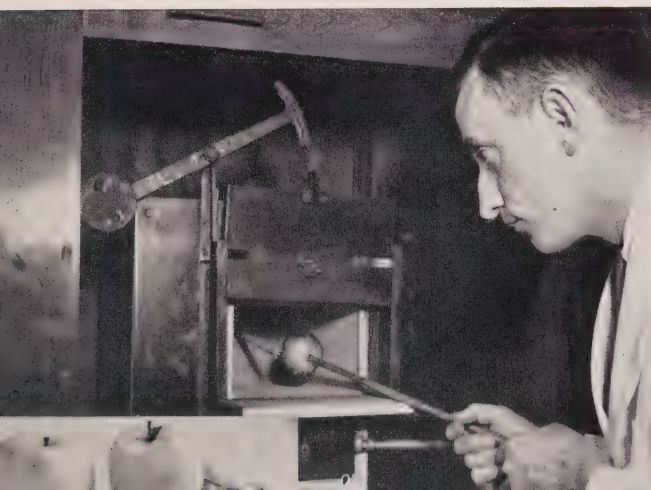
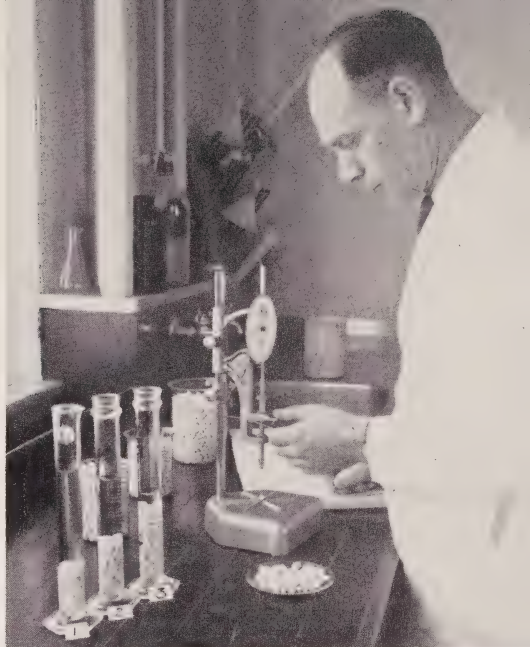
varieties of apples have been grown in the Division's experimental plots. The new varieties to assess their acceptability as

been conducted to find a method for removing the peel from a laboratory-size tunnel, the food technologists have been investigating temperature peeling (1500°F.) or infra-red radiation. The loss of 15% by weight; apple (left) peeled in high

an important quality factor. Objective methods for determining the flavor components from apple juice. In the laboratory, the flavor components from apple juice.

has been shown in the "Manitoba" tomato—a new variety. *Upper inset:* Morden's food technologists and home economists are working on the "Manitoba" variety (left). The "Manitoba" has more desirable size and smoothness. For processing, it has desirable size and smoothness. A vacuum concentrator to prepare a tomato paste

have found that the processing time of dry beans is the final pork and beans product. This has been determined. In photo, the food technologist is determining the cooking time, while the beans in the numbered graduates are being soaked. (2) one in 170°F. water and a 4-hour soak. The latter is quite adequate and is now





Good irrigated pasture.

Typical range dry-land pasture.



Improved range-land pasture by seeding down to wheat grass.

PASTURE IMPROVEMENT RESEARCH

Pasture research is being conducted by several Experimental Farms across Canada. A productive pasture represents the most important source of highly nutritious fodder for livestock in a relatively cheap and very convenient form. Yet it is usually the most neglected crop on the average farm, often consisting of the roughest and most unproductive land. For this reason actual pasture yields are far below potential production. On the other hand, many farmers have increased their production through instituting a well-balanced pasture program—an achievement that indicates the value of pasture improvement studies.

Maritime dykeland pastures: unfertilized and fertilized (right).



GOOD QUALITY HIGH YIELDING SCAB-RESISTANT POTATO SEEDLING

A scab-resistant potato seedling, 1711-9, originated at Fredericton, gave the highest yield in a trial at Salmonhurst, N.B., and has been rated highly in trials in Ontario.

YAMASKA, A NEW YELLOW LILY

A new outward-facing yellow lily has been named Yamaska and introduced by the Horticulture Division at Ottawa. This lily has shown a very vigorous growth habit in test gardens at Ottawa.

DISTRIBUTION OF SHELTERBELT MATERIAL

Some 5,983,015 broadleaf trees and 134,915 evergreens were distributed by the Forest Nursery Stations at Indian Head and Sutherland, Sask. Almost 47 per cent of the broadleaf trees were planted in field shelterbelts by 793 farmers, a large number of whom are located in Manitoba.

GENETICS, CYTOGENETICS, AND PHYSIOLOGY

CRABAPPLE CHARACTERISTICS DOMINANT

In the apple breeding program at Morden it has become evident that in crosses between crabapples and large-fruited varieties the result is general dominance of the crabapple characteristics in the seedlings, particularly in regard to fruit size, color, shape, texture, and flavor. Out of a population of 435 seedlings from the cross Dolgo \times Lobo, only one has produced fruits over 2 inches in diameter while over 400 had fruits under 1½ inches in diameter. Similarly, fruit shape, color, texture, and flavor all resembled the Dolgo parent.

TETRAPLOID HYBRID SNAPDRAGONS AND LILIES INTRODUCED

Two tetraploid hybrid snapdragons, originated at Ottawa, were given introduction numbers in 1955. These are Ottawa Tetraploid Hybrid No. 5, a deep rich bronze color, and Ottawa Tetraploid Hybrid No. 6, a shell pink. Seed of these two hybrids and of Ottawa Tetraploid Hybrid No. 4, the best of four pink hybrids, will be produced this winter.

Tetraploid Addington and Mosquito lilies have been produced at Ottawa and are characterized by stouter and stiffer stems than the corresponding diploids. There is very little increase in flower size.

PROPAGATION BY HIGH HUMIDITY SYSTEMS

Increased attention has been given at Ottawa to the general field of horticultural plant propagation and to the use of high humidity systems such as continuous and intermittent mist. Partial evaluation has been done on these methods in the propagation of both nursery and ornamental material. Investigations into methods of propagation of the Ottawa rootstock *M. robusta* No. 5, which is presently multiplied by stooling methods, have shown that both soft tip and leaf bud cuttings propagated readily under intermittent or continuous mist.

IMPROVED METHOD OF PROPAGATING

A satisfactory method of propagating American and Christine Buisman elm by leafy stem cuttings has been evolved at L'Assomption as part of a program to find resistance to the Dutch Elm disease. Cuttings are taken

during the period from June 15 to July 25 and treated for 24 hours with indolebutyric acid (50 grams per liter). They are then placed in medium sand in the greenhouse under conditions of high humidity and relatively low light intensity (about 200 foot-candles) during the rooting period.

INCOMPATIBILITY OF CERTAIN APRICOT VARIETIES WITH PEACH ROOTSTOCKS

Apricot varieties, such as Reliable, Riland, Perfection, show a marked incompatibility with peach rootstocks, resulting in breakage at the bud union in the nursery or during the early years in the orchard. Since peach seedlings are widely used as rootstocks for apricot in British Columbia, a routine practice has been established at Summerland of testing the compatibility of promising apricot seedlings on peach understocks.

CONTROL OF DAMPING-OFF DISEASES

Studies in the control of damping-off diseases by the use of fungicides have been under way at Indian Head. In greenhouse tests, the emergence of seedlings from seed of Colorado spruce, Scots pine, and caragana was increased 11 per cent by an application of Captan or Terzan at a rate of 0.1 grams per square foot. Post-emergence losses due to *Rhizoctonia* damping-off were reduced by 35 per cent by a similar application of either fungicide. The average stand was increased from 40 to 65 per cent, and from 40 to 76 per cent by light applications of Captan and Terzan, respectively.

NUTRITION AND IRRIGATION

IRRIGATION OF TREE FRUITS

At Summerland, satisfactory irrigation procedures have been set up using electrical resistance blocks. These blocks are set about 6 inches deep with most crops, but at a depth of 8 to 9 inches with tree fruits. When the blocks indicate that the soil moisture at that depth is approaching the "wilting point", it is considered that irrigation should be begun. Blocks placed at greater depths indicate the progress of the wetting front downward and indicate when sufficient water has been applied.

IRRIGATION INCREASED THE YIELDS OF TOMATOES

Trials conducted at Smithfield during the past two seasons have shown that irrigation has increased the yields of canning tomatoes. In one method, plots were irrigated at a rate of $\frac{1}{2}$ to $\frac{3}{4}$ inch whenever the available soil moisture dropped below 50 per cent as indicated by Buoyoucos plaster of paris blocks set at root depth. In another method, $\frac{1}{2}$ to $\frac{3}{4}$ inch of irrigation was added every seven rainless days. Considerable increases in marketable yields were obtained by both methods, not only in the total amount of fruit each season but also in early yields. Yields were higher with the Buoyoucos block procedure than with the rule of thumb method. During these studies, consideration was given to the Thornthwaite equation for evapotranspiration and a bookkeeping system of soil moisture balance was set up. Results have indicated that irrigation should be practised whenever the deficit is greater than 4 inches.

FERTILIZER REQUIREMENTS OF CUCUMBERS

Studies at Kentville have shown that maximum yields of pickling cucumbers were obtained with fertilizer applications of 150 pounds of ammonium nitrate and 1,000 pounds of superphosphate per acre, and that yields were

positively associated with levels of phosphorus in the plants. The average levels of phosphorus in the leaves of plants were found to be increased three times when 15 tons of manure per acre was also applied. It is apparent that manure plays an important role in the utilization of phosphorus by the cucumber plant.

FERTILIZER EFFECT AND WEED CONTROL OF UPLAND CRANBERRIES

One serious effect in attempting to increase the yields of upland cranberries by fertilizer application has been an increase in weed competition. Experiments conducted by the Charlottetown Experimental Farm at Blooming Point have shown that complete fertilizers greatly increase the influx of clovers. Nitrogen applied alone has given an excellent growth response with no accompanying increase in clover population. Ammonium nitrate or sulphate of ammonia, applied at a rate of 135 pounds per acre, together with 200 gallons of varsol greatly improved cranberry yields with no increase in weed competition. Fertilizers applied alone, however, proved detrimental to vine stands and yields.

SEED AND VEGETATIVE STOCKS

VIRUS DISEASES OF RASPBERRIES AND STRAWBERRIES

Raspberry indexing was continued in 1955 at Ottawa to provide virus-free nuclei of recent selections and named varieties already introduced by this Division. Two hundred and fifteen plants were successfully indexed this year. Healthy plants were found in 22 of the 25 recent selections indexed, in the Ottawa varieties Madawaska, Muskoka, Rideau, Carnival, Comet, O-381, O-384, and in the standard varieties Bonanza and Williamette. During the past two years, 97 plants of the variety Ottawa were indexed but only seven were found to be free of virus. These plants will all be re-tested in 1956 and, if they prove healthy, will serve as a nucleus for the propagation of virus-free Ottawa, a variety that had become heavily infected with viruses.

Four virus-free varieties of strawberries fruited at the Kentville Farm in 1955. The average yield of virus-free stock of these varieties, Catskill, Sparkle, Senator Dunlap, and Premier, was three times greater than that from ordinary stock. It was also noted that virus-free stock stood up better during dry weather and fruited over a longer period. A scheme for growing virus-free strawberry plants has been put into effect in Nova Scotia.

POTATO VARIETY TRIALS IN THE PRAIRIE PROVINCES

During the past year, a Potato Isolation Station was established at Scott, Sask. This station will index, by biological and visual methods with indicator plants in the greenhouse, the incidence of virus diseases in tubers of all seedlings and varieties of potatoes for evaluation tests in the Prairie Provinces. The Station will also propagate and maintain nucleus disease-free stocks of seedlings and varieties for test purposes, and multiply seed stock of varieties that will be licensed and introduced.

SPRUCE CONES SHOULD NOT BE HARVESTED UNTIL MOISTURE BELOW 50 PER CENT

In the course of spruce seed viability investigations at the Forest Nursery Station at Indian Head, efforts were made to determine the optimum stage of maturity for harvesting cones of white and Colorado spruce. From the data obtained, it appears that white spruce cones should not be harvested until the average moisture content of the cone falls below 50 per cent (net weight)

or the specific gravity is less than 0.80. By delaying cone harvesting until optimum maturity, the maximum production of sound seed was obtained. With Colorado spruce, the results suggest that the harvesting of cones should be delayed until the average moisture content falls below 50 per cent or the average specific gravity is less than 0.92. For practical purposes, it is recommended that harvesting of cones of both white and Colorado spruce for seed production be delayed until cones float in linseed oil, which has a specific gravity of 0.94.

STORAGE AND PROCESSING

POLYTHENE BOX LINERS FOR PEARS

Favorable market reaction to pears stored in sealed polythene box liners is leading to increased use of this type of pack in British Columbia. Tests made at Summerland showed that the storage period of Anjou pears was extended about two months by storage at 32° F. in sealed 1.5 mil polythene box liners. Quality and flavor were considered good. Analyses showed that the atmospheres within the liners reached equilibrium within about a week of packing and subsequently remained fairly constant. Carbon dioxide content of approximately five per cent showed little variation from box to box, but oxygen content varied from 4.2 to 13.8 per cent. Problems inherent with film packs are related to high humidity with resultant increase in the incidence of rots and adverse gas concentrations which may cause injury under certain conditions. Up to the present, indications are that a fungicidal wash and use of copper-treated wraps may be advisable, and that film thickness should not exceed 1.5 mil.

DEEP SCALD OF APPLES

Lobo, an apple variety of considerable grower and consumer appeal, is susceptible to a serious type of disorder in storage known as deep scald. Attempts have been made at Ottawa to determine the factors causing this disorder in Lobo. It has been found that deep scald is more common at storage temperatures of 30° to 33°F. than at 35°F. or higher, and that susceptibility increases with maturity at harvest and delay between harvest and storage.

FRUIT PIE FILLINGS

At Summerland, a blend of fruits in a pie filling that made a very acceptable open-faced pie contained equal proportions of apricot, peach, apple, and pear with five maraschino cherries to each 20-ounce can. The predominant flavor was apricot. As apricot and pear are expensive ingredients, a formula was tested using 20 per cent apricot, 20 per cent pear, and 30 per cent each of both peach and apple. This product, when made into an open-faced pie, had predominantly peach flavor. It is possible that it would find considerable sale as a dessert rather than a pie filling.

POULTRY

FEEDING

GOSLINGS HAVE A MODEST REQUIREMENT FOR CALCIUM AND PHOSPHORUS

At Ottawa, it was found that 0.5 per cent calcium in the diet met the requirements of the Pilgrim gosling as indicated by growth rate and bone calcification. Rickets and marked growth depression did not occur until the

calcium level in the diet was reduced to 0.25 per cent. It was also found that goslings did not require more than 0.6 per cent total phosphorus in the diet. The low calcium requirement of the gosling is surprising when it is considered that the chick, which grows at less than one-fifth the rate of the gosling, requires 1 per cent calcium in the diet for optimum growth.

NO BENEFIT FROM FEEDING HIGH LEVEL OF ANTIBIOTIC TO HENS IN BATTERIES

Inclusion of 100 grams of antibiotic per ton of feed caused no increase in egg production with hens in laying batteries. Furthermore, the antibiotic did not hasten recovery from an outbreak of Newcastle disease which occurred during the experiment and which caused egg production to drop to zero. It is often claimed that antibiotic feeding hastens recovery from virus diseases by stimulating appetite and by controlling secondary infections. Presumably, this does not necessarily occur where the birds are housed on wire with a low exposure to infection and where the environmental temperature is high, favoring rapid recovery from Newcastle disease.

PELLETING BARLEY MAKES IT USEFUL IN BROILER RATIONS

Coarse grains such as barley and oats are cheaper than low-fiber grains such as corn and wheat, but the latter have been preferred in broiler rations because of their higher energy content. However, it has been found at Ottawa that up to 50 per cent barley can be included in broiler rations with little or no drop in growth rate if the diet is pelleted. Carcass grade for fat is slightly poorer on rations containing high levels of barley, but this can be counteracted, if necessary, by feeding a ration containing more corn and wheat for the last two or three weeks.

PROTEIN AND ENERGY LEVELS IN LAYING RATIONS

A protein level of 15 per cent of the diet has been found to support optimum egg production in high producing birds. When the energy of the diet was raised by eliminating coarse grains and using only corn and wheat, feed efficiency was improved but there was no improvement in egg production.

RESTRICTED FEEDING OF REPLACEMENT STOCK ON RANGE ECONOMICAL

Restricted versus full feeding of replacement stock on range has been tested at Nappan and Brandon. The restricted birds ate 25 per cent less feed than the full-fed controls. At the end of the subsequent laying year, there was no difference in egg production between the two groups nor in the pounds of feed required to produce a dozen eggs while in the laying house. The feed saved by restricting the birds on range, therefore, constituted a net saving in production costs. Birds that were restricted on range came into production later and laid fewer eggs at the first of the laying year, but more eggs at the end of the laying year.

ADVANTAGES IN PELLETING BROILER RATIONS

Pelleting broiler rations has been found at Ottawa to improve growth rate, feed efficiency, and carcass finish. This occurs on both high and low energy diets, although the improvement due to pelleting is more marked with low energy rations. The improvement in growth on pelleted diets cannot be explained solely in terms of an increase in feed consumption because the relative increase in feed intake is much less than the increase in body weight. It was also found that the variation in body weight between broilers fed

pellets was less than that of broilers fed mash. Reduction in variation is important from the standpoint of producing a more uniform commercial product, but it is also important in experimental work, since it makes it easier to demonstrate differences between treatments.

BREEDING

HYBRID VIGOR IMPORTANT FOR MOST MEAT AND EGG PRODUCTION TRAITS

Analysis of three years data obtained at Charlottetown, Lethbridge, and Ottawa on the results of crossing meat strains of birds, has shown that hybrid vigor may be important for some traits but not for others. Body weight at broiler age shows some hybrid vigor from crossing. Other body measurements which are used in assessing market quality, such as shank and keel length, show hybrid vigor but measurements designed to indicate breast fleshing show no hybrid vigor. The crossbreds were intermediate between the parent strains in market quality as determined by official market grades. Egg production in the crosses was much superior to either of the parent strains and crossing resulted in a very marked improvement in this trait. Fertility and hatchability were also slightly better in the cross-matings than in the pure strains.

LOCATION AND STRAIN EFFECTS ARE BOTH IMPORTANT IN BROILER PERFORMANCE

Ten strains of broilers were each raised at three locations, Ottawa, Lethbridge, and Charlottetown. Analyses were completed on various traits associated with meat quality, in order to determine the effect of location and strain on these traits and also to test for the presence of strain and location interaction. Strain effects accounted for slightly more of the variation in these traits than did location effects although the location effects were quite large. There was little evidence that strains would rank differently in the different environments. It was concluded that providing a good environment is almost as important as the selection of the strain of broilers to be raised, although the best strain at any location would still give the highest performance at any other location.

INDIVIDUAL PENS SUPERIOR TO INTERMINGLING FOR COMPARISONS OF STRAIN PERFORMANCE

An experiment completed at Kentville shows that pen affects are not evident in a house designed for strain testing. Since data can be obtained on feed consumption when strains are penned in separate pens and since labor costs are reduced when trapping is eliminated, comparisons of strains should be made by penning the birds separately. There was no evidence from this test that production differed when birds of different strains were maintained in a pen containing 600 birds and in pens containing 50 birds. There was no evidence of a side-of-the-house effect in this house which had a center alleyway and pens on each side and was oriented in an east-west direction with the windows facing both north and south.

GENETIC DIFFERENCES IN HOCK ABNORMALITY OF MALE TURKEYS

An abnormal hock condition, resembling perosis, occurred in the Ottawa flock of Empire White turkey males, starting at about 16 weeks of age. There was a distinct genetic effect on the incidence, which varied from 0.0 to 71.4 per cent for different sire groups within hatches. Sire progeny groups performed similarly in different hatches. Hatches varied in incidence, from 5.6 to 28.5 per cent. No direct relationship between body weight at 12 weeks and this incidence was observed.

PHYSIOLOGY

HOLDING TEMPERATURE FOR FOWL SEMEN IMPORTANT

The holding temperature for fowl semen being used for the artificial insemination of hens affects the fertilizing capacity of the semen. The best storage temperatures were found to fall within the range of 10°C. to 20°C., and there was evidence that 15°C. was slightly better than 10°C. or 20°C. Holding semen at temperatures outside this range caused a marked drop in fertilizing capacity.

MARKED SEASONAL TRENDS IN BLOOD AND MEAT SPOTS OF EGGS REVEALED

A recent study completed at Morden shows a definite increase in blood spots from a low in October to a high in March and a slight decline in mid-May. Most of this increase in blood spots was shown to be due to an increase in the larger sized spots. There was only a slight increase in the small sized spots over the ten-month period of the experiment. Since only White Leghorns were used for this study, colored meat spots were not of any importance. There was, however, a very significant increase in the total number of white meat spots of all sizes from October to March followed by a slight decline to the end of the test in June.

HOUSING AND MANAGEMENT

PRODUCTION OF EGGS REDUCED BY TOO LITTLE HOPPER FEEDING SPACE

A test at Kapuskasing contrasted 50 linear feet of feeding space per 100 birds with only 20 feet per 100 birds. Ten eggs less were produced per bird when restricted to the smaller feeding length.

A COMBINATION OF SNOW AND WATER CAN SUBSTITUTE FOR WATER ALONE FOR LAYING BIRDS

At Kapuskasing, it was shown that snow rather than water in the drinking containers for laying birds reduced egg production. A further experiment indicated that, if water was made available at mid-day for one to two hours (until it froze) and snow the rest of the time, production was equally as good as when water was always available.

TOBACCO

PHYSIOLOGY AND BIOCHEMISTRY

COMPOSITION LARGELY DETERMINES QUALITY IN FLUE-CURED TOBACCO

Studies at Delhi show that the chemical composition of flue-cured tobacco is closely correlated with quality. High quality leaf, compared with common leaf, contains a high percentage of total sugars and reducing sugars but a low percentage of calcium, total ash, soluble ash, nicotine, total alkaloids, and total nitrogen. High sulphur content lowers the fire-holding capacity while high chlorine delays the rate of burn of cigarettes. Results indicate that nitrogen applications must be controlled within narrow limits to maintain high quality in flue-cured tobacco. Over the application range of 10, 20, and 30 pounds per acre of nitrogen, with adequate potash and phosphorus, each increment of nitrogen significantly lowered the total sugars but raised the total alkaloids, nicotine, and nitrogen in the cured leaf.

COMPOSITION CHANGES WITH ADVANCING MATURITY

A chemical picture of the life of a flue-cured tobacco leaf was obtained. On the basis of percentage composition, the total nitrogen and total protein decreased throughout growth, phosphorus fell sharply during leaf enlargement, calcium increased throughout growth, and potassium, chlorine, and photo-synthetic pigments increased during the initial phase of growth, then declined. The amounts of these ingredients per leaf increased during growth, then, with the exception of calcium, decreased after full size of leaf was attained.

SULPHATE AND CHLORIDE AFFECT YIELD OF FLUE-CURED TOBACCO

The differential response of flue-cured tobacco to the sulphate and chloride sources of potassium in sand culture was studied at Ottawa. The lowest dry weight yields were produced when all the potassium was supplied as sulphate and the highest yield when the potassium was supplied half as sulphate and half as chloride. The all-chlorine source of potassium resulted in the highest water content of the leaves at harvest time. The chlorine content of the leaves increased directly with chlorine supply and increased with leaf position from the bottom to the top of the plant.

BREEDING AND TESTING

The tobacco breeding and testing program included several new varieties and strains imported from foreign sources and others that were developed at Harrow, Delhi, and Ottawa.

BURLEY 1 IS OUTSTANDING CIGARETTE VARIETY

In the final testing at Harrow of 12 varieties obtained from Grenville, Tennessee, in 1951, the Burley 1 variety continued to show outstanding merit for the production of the new type cigarette burley tobacco. It possesses the fine cigarette quality of Harrow Velvet, one of its parents, but it produces a larger yield and is more easily cured. The tests show that it is highly resistant to both black root rot and brown root rot. It is estimated that 83 per cent of the cigarette burley grown in Ontario in 1955 was of the variety Burley 1.

IMPROVED BRIAR RELEASED FOR PRODUCTION

The export type burley variety, Improved Briar, developed in the breeding program at Harrow, was released for commercial production in 1955. It is the first root-rot-resistant heavy type to be developed with superior wrapper grade.

FLUE-CURED VARIETY, WHITE GOLD, RECOMMENDED FOR COMMERCIAL PRODUCTION

At Delhi, the testing of new varieties has been important in maintaining the high standard of leaf quality of flue-cured tobacco grown in Canada. During 1955, an imported variety developed from a cross between Oxford 492 and Golden Yellow was tested under the name of White Gold. White Gold showed high resistance to both black root rot and brown root rot, higher leaf quality than either Hicks or Delcrest, and such characteristics as high yield, fairly low stem percentage, normal maturity, and medium sucker growth. It has been selected recently for registration in Canada for commercial production.

NUTRITION AND MANAGEMENT

LAYER OF VERMICULITE IMPROVES SEEDLING GROWTH

The production of a uniform stand of tobacco seedlings is promoted by spreading a layer of coarse vermiculite to a depth of one-eighth to one-quarter inch on the surface of the seedbed immediately after seeding. Tests at Delhi show that this material provides a protective layer against adverse moisture and temperature conditions and prevents the seedlings from growing on the surface of the seedbed muck.

FERTILIZED RYE IN FLUE-CURED ROTATION MAINTAINS SOIL ORGANIC MATTER

Nitrogen fertilization of the rye crop preceding flue-cured tobacco is beneficial to the tobacco crop. In experiments at the Delhi Station, the application of 75 pounds per acre of ammonium nitrate on the young rye crop in the spring increased the grain yield from 18.4 to 34.7 bushels per acre and the dry matter of the crop from 4,900 to 9,400 pounds per acre. This practice, in addition to 60 pounds of ammonium nitrate per acre applied when the mature rye is disked into the soil in August, tends to increase or maintain the organic matter content of the soil without delaying the maturity of the subsequent flue-cured tobacco crop.

ADDITIONAL POTASH AND PHOSPHORIC ACID IMPROVE FLUE-CURED CROPS

Tests at St. Thomas, Que., showed that, in addition to 1,200 pounds per acre of a 2-12-10 fertilizer mixture, 50 pounds per acre of potash broadcast either in the fall or spring before planting produced a significant increase in the acre value of the crop. Also, an application of 40 pounds per acre of phosphoric acid in the spring before planting increased the crop value.

SPLIT APPLICATION OF FERTILIZER BENEFITS DARK TOBACCO

At Harrow, dark tobacco responded well to 1,000 pounds per acre of a 5-10-5 fertilizer mixture, half applied at the time of planting and the remainder applied as a side dressing three weeks after planting.

OPTIMUM SPACING FOR BURLEY AND DARK TOBACCOS

The maximum yield of high quality cigarette burley tobacco was produced at Harrow when the rows were spaced 40 inches apart with the plants 16 to 18 inches apart in the rows in conjunction with high topping when 75 per cent of the plants were in flower. These practices also reduced the sucker growth with consequent reduction in the cost of suckering. Spacing the rows 42 inches apart with 30 inches between plants in the row gave best results for dark tobaccos.

IRRIGATION

Supplemental irrigation greatly improved both the yield and quality of burley tobacco in a three-year test at Harrow. At Delhi, the regular fertilization practices for non-irrigated flue-cured tobacco were suitable for the irrigated crop under most conditions.

CHEMICAL REDUCES SUCKER GROWTH ON TOBACCO

Maleic hydrazide, sprayed on the tobacco crop following topping, effectively reduced sucker growth. This treatment on flue-cured tobacco at Delhi tended to increase yield and hasten maturity and in the cured leaf sugar content

was increased while total ash content was decreased, these being desirable characteristics. At Ottawa, the treatment gave good control of sucker growth on cigar tobacco. The nitrogen content increased slightly in the top leaves but decreased in the bottom leaves.

CURING OF FLUE-CURED TOBACCO

In co-operation with the Ontario Research Foundation a comparative study was made of different systems for curing flue-cured tobacco.

FORCED AIR CURING EFFECTIVE BUT COSTLY

Forced air curing systems for flue-cured tobacco were compared with conventional curing systems in a two-year test at Delhi. The forced warm air system produced leaf of approximately the same grade as that produced by the other systems. It cured tobacco when the kiln was loaded with 20 per cent more tobacco than handled by the other systems.

The operation of the forced warm air system was simple and convenient, and the operation, servicing, and maintenance costs are likely to be low compared with most conventional systems. The forced warm air system reduced curing time by at least ten hours. It also greatly reduced the fire hazard in the kiln compared with conventional systems. However, the initial cost of the system was considerably higher than that of the older systems.

GASES EVOLVED DURING FLUE-CURING DO NOT INCREASE FIRE HAZARD

As part of the investigation into tobacco curing, the possible occurrence of inflammable gases in tobacco kilns was studied. It was determined that hydrocarbons, if present at all, did not exceed one-fiftieth of the concentration in the air required for self-sustained combustion. The results indicated that it is unlikely that the tobacco leaves give off sufficient gaseous matter during the flue-curing process to support combustion.

ILLUSTRATION STATIONS

During 1955, work was conducted on 227 Illustration Stations throughout the ten provinces comprising a total area of 118,016 acres of land, of which 77,036 acres were in crops on which factual records were obtained and detailed production studies conducted. These station farms are operated on privately owned properties on the basis of a co-operative agreement entered into between the owner and the Experimental Farms Service. In the distribution by provinces, 23 are in British Columbia, 30 in Alberta, 53 in Saskatchewan, 16 in Manitoba, 23 in Ontario, 40 in Quebec, 14 in New Brunswick, 15 in Nova Scotia, 7 in Prince Edward Island, and 6 in Newfoundland. The average size of Illustration Station farms in Western Canada was 805 acres, of which 552 acres were in cropland. In the Eastern Provinces, the average size of Illustration farms was 216 acres, of which 113 acres were under crop. These Illustration Station operators had a total capital investment of \$7,799,990, representing \$45,558 per station farm, \$66.09 per acre of total land, and \$101.25 per acre of cropland.

Illustration Station farms are so located that they represent areas and soil types not covered by the Experimental Farms with which they are associated. This enables an enlargement of the comprehensive work being conducted on the Experimental Farms in each province as well as production studies under conditions typical of commercial farming.

ILLUSTRATION STATIONS WORK WELL UNDER WAY IN NEWFOUNDLAND

Illustration Stations are now established in five agricultural areas in Newfoundland. Two stations are located in the eastern part of the island, one in the Avalon outport area at Carbonear on the west shore of Conception Bay, and the other in the Bonavista Bay outport area at Lethbridge. Of the western stations, one is at Cormack near the northern end of Deer Lake, the second at Heatherton on St. George's Bay in the Robinsons-McKay-Heatherton area, and the third is at Doyles in the Codroy Valley, about 27 miles from Port Aux Basques.

The special substation at Avondale, at the southern end of Conception Bay, where research and developmental work on blueberry production is under way, comprises a sixth unit under this division of work in Newfoundland.

HIGH LEVELS OF NITROGEN GAVE INCREASED YIELDS OF PRAIRIE STUBBLE CROPS

The amount of waste left after combining the heavy fallow crops of recent years has caused severe depression in the yield of stubble crops. The effect of applying varying rates of nitrogen and phosphate as a means of overcoming this depressing effect was studied on three stations in the Brown, nine in the Dark Brown, six in the Black, seven in the Gray Black, and three in the Gray Wooded soil zones. Yields increased in a linear manner with increased applications of nitrogen on the majority of the stations. The effects of increased applications of phosphate were linear at one station in the Brown, five in the Dark Brown, four in the Black, and at two stations in the Gray Black soil zones.

Fall applications of anhydrous ammonia and ammonium nitrate were compared at Claresholm and Nobleford in Alberta. At Claresholm there was some advantage to anhydrous ammonia at the low and mid-level rates but both preparations were equally effective at the high rate of 99 pounds of nitrogen per acre. With wheat on flax stubble at Nobleford, a spring application of ammonium nitrate was more effective than a fall application of anhydrous ammonia where both were applied at the rate of 33 pounds of nitrogen per acre.

These results indicate that nitrogen is important in maintaining yields of stubble crops and that the lower yields generally recorded on stubble land, even in years of moderate moisture, may be largely due to nitrogen deficiency.

SOME PLANT NUTRIENTS FOUND BENEFICIAL ON CERTAIN GRAY SOILS

Experiments conducted on four major soil series, Loon River, Dorintosh, Garrick, and Nampa, within the Gray Soil area of the northern Prairie Provinces during the period 1947-1954 have revealed that the nutrient deficiencies are somewhat specific for the different types. In general, nitrogen had no beneficial effect on yield when applied alone. Sulphur increased the yield of fallow wheat by 20 per cent on the Loon River soil series but on no other soil under study. Phosphorus increased the yield of wheat on each soil series with increases ranging from 12.8 per cent on the Loon River series to 27.6 per cent on the Garrick series. Potassium gave slight, but consistent, yield increases only on the Garrick series. The combination of nitrogen and phosphorus gave substantial wheat yield increases on each soil series while nitrogen and sulphur produced the best results on the Loon River series. These combinations were more effective than nitrogen, phosphorus, or sulphur applied singly. The effect of the applied nutrients was not generally substantial on the succeeding legume hay crops except on the Loon River series where three to four-fold yield increases from sulphur were common.

WILD OAT CONTROL UNDER FARM CONDITIONS

Isoprophyl-N-phenylcarbamate (IPC) at 10 and 15 pounds per acre, and trichloroacetic acid (TCA) at 20 pounds per acre were applied to summer-fallow and stubble cropland late in the fall of 1954 at Durban, Grandview, and Goodlands in Manitoba. The 10-pound per acre application of IPC reduced the wild oat population by approximately 50 per cent while the 15-pound application gave reductions up to 90 per cent. The 20-pound per acre application of TCA reduced the population of wild oats by 75 to 98 per cent. Both chemicals, at the rates used, had a severe effect on the stand of wheat, oats, and barley causing from 50 to 100 per cent crop loss. Flax showed greater tolerance with 80 per cent survival under IPC and 92 per cent under TCA treatment.

PASTURE SEEDING MIXTURE AND FERTILIZATION IMPORTANT ON DEPLETED SOILS

A project initiated in 1952 on the Gray soils at Brainard, Alta., comparing three different pasture swards with and without commercial fertilizer, and the effect of grassland conditions in restoring the productivity of the depleted soil, has given valuable information. The grass-legume pasture was superior to grass grown singly. Similarly, fertilizer response as measured by forage yields and total digestible nutrients was readily apparent. Sheep gains on the plots reflected the forage yields and total digestible nutrient data.

DUTY-OF-WATER STUDIES ON VANCOUVER ISLAND

Duty-of-water studies are being conducted at three locations on each of the six soil types on Vancouver Island. Using pasture as the indicator crop, it was found that while soil texture was an important consideration from the standpoint of duty of water, other factors such as height of water table, drainage, and elevation had their specific effect.

In 1955, the lightest textured soil, Cassidy loamy sand, recorded the greatest duty of water and the lowest dry matter yield of pasture herbage. All soils of the Chemainus series recorded a relatively low duty of water and high pasture yield regardless of textural properties. The low duty of water recorded by soils of the Chemainus series is considered due to the high water table normally associated with these soils. Fairbridge clay loam, while moderately heavy textured, is well drained and recorded a moderately high duty of water, and Cowichan clay, a low lying, heavy textured soil, recorded a relatively high duty of water.

FERTILIZER REQUIREMENT CHANGES IN A CONTINUOUS PRODUCTION PROGRAM

In a four-year rotation of potatoes, oats, clover, at Luceville, Que., during the period 1948-1951, potato yields increased with increased levels of application of nitrogen and phosphorus. During the second period, 1952-1954, on the same plot areas, there was no measurable response to increased levels of phosphorus but there were significant increases in yield from higher levels of nitrogen and potassium.

HEAVY FERTILIZATION OF POTATOES GAVE CONSISTENT YIELD INCREASES IN P.E.I.

In an experiment conducted through eight years on seven stations in Prince Edward Island, 5-10-10 fertilizer was applied at rates of 1,000, 1,500, 2,000, and 2,500 pounds per acre. Average yields recorded through the eight-year period were 300, 326, 337, and 354 bushels per acre, respectively. When manure was added at 10 tons per acre, the overall response was approximately 40 bushels per acre higher than with commercial fertilizer alone.

SIZE OF SEED SET AND SPACING AFFECTED YIELD OF POTATOES

In a production study at Mavillette, N.S., using the variety Keswick, it was found that yields were increased about 23 per cent by using four-ounce rather than two-ounce sets. Decreasing the seed spacing in the row from 12 to 9 inches increased yield by 16 per cent, and from 12 to 6 inches by 28 per cent. Two-ounce sets planted at 12-inch spacing and fertilized with 1,000 pounds per acre of 6-12-12 yielded 179 bushels per acre while four-ounce sets planted at 6-inch spacing and fertilized with 2,000 pounds of 6-12-12 yielded 474 bushels per acre.

THE HAY MIXTURE USED PRODUCED SIGNIFICANT EFFECTS ON SUCCEEDING CROPS

A study conducted at Mindemoya, Ont., during the past nine years revealed that the hay mixture seeded had a highly significant effect on the yield of the crop following breaking. A swede crop following a Grimm alfalfa sod yielded 30.4 tons per acre as compared with 25.4 tons per acre where the swedes followed a mixture of timothy, red clover, orchard grass, and alsike. The crop following Grimm alfalfa significantly outyielded those following 10 of the other 13 hay mixtures studied. In general, the better swede crops were produced on the areas that had produced the best hay crops.

SEASONAL VARIABILITY CRITICAL PROBLEM IN PASTURE PRODUCTION

A study of 736 pasture yield records obtained on 109 Illustration Station farms during the past 12 years indicated that there was considerable variability in pasture production from season to season on permanent swards. While yields in the Maritime Provinces were higher than in Ontario and Quebec, variation from year to year was considerably greater. Fertilization of permanent swards gave average yield increases of from 48 per cent when fertilized with 600 pounds of 20 per cent superphosphate every three years to as much as 94 per cent when fertilized every year with 1,000 pounds of a 2-12-6 formula. However, the fertilization had very little effect on the reduction of yield variation from season to season. It would appear, therefore, that climate has a more specific effect than fertilization on pasture production from year to year, particularly where native species are involved.

ILLUSTRATION STATIONS SERVE AS IMPORTANT SOURCE OF SEED

In all instances where cereal varieties are found to have particular adaptation, an area is seeded on Illustration Station farms, thus providing a source of seed to farmers in the districts served. During 1953, wheat, oat, and barley varieties were tested on 170 station farms. In the same year, a total of 96,320 bushels of seed of improved varieties of cereals, 69,850 pounds of grass and legume seed, and 7,500 bushels of "foundation stock" and certified seed potatoes of improved varieties were produced and sold by operators of Illustration Stations.

In 1955, 1,280 different farmers and some co-operatives procured seed from 164 operators of Illustration Stations. Some 90,220 bushels of seed grain was produced and sold in Western Canada. Of the total amount of grass and clover seed produced and sold, 45,633 pounds were produced in the western supervisory districts and 24,215 pounds on stations in Eastern Canada. Sales of seed potatoes were largely confined to New Brunswick and Prince Edward Island.

FIELD DAYS

During 1955, 122 field days were held on Illustration Stations across Canada. Total attendance was 10,075 or an average of 82 people per meeting. The field days provided an opportunity for farmers to view experimental and production projects being conducted under conditions similar to those encountered on their own farms and to discuss their problems with officials of the Department.

PUBLICATIONS

DIVISIONAL PROGRESS REPORTS

Apiculture, 1949-53
Field Husbandry, Soils and Agricultural Engineering, 1949-53
Illustration Stations, 1949-53
Horticulture, 1949-53

BRANCH FARMS PROGRESS REPORTS

Lennoxville, Que., 1947-52 (English)
Fredericton, N.B., 1948-52 (French)
Normandin, Que., 1947-52 (French and English)
Kapuskasing, Ont., Makamik and associated Illustration Stations, 1949-53
Manyberries, Alta., Range Experimental Farm, 1948-53
Woodslee, Ont., Soils Substation, 1947-53
Scott, Sask., 1948-53
L'Assomption, Que., 1947-52 (French and English)
Summerland, B.C., 1949-53
Fredericton, N.B., Blueberry Substation, Tower Hill, 1949-53
Kamloops, B.C., Range Experimental Farm, 1947-53
Saskatoon, Sask., Forage Crops Laboratory, 1949-53

BULLETINS

<i>Publication Number</i>	<i>Author and Title</i>
600	McIver, R. N., and E. V. McCurdy. The improvement of burn-out lands in south central Saskatchewan. (Revision).
619	Walkof, C. Hints on dry land gardening. (Revision).
686	Wilson, H. E., J. G. Stothart, and G. E. DeLong. Swine production. (French).
689	Braun, E., and J. E. Geiger. Comparison of methods for wintering honeybees in the Prairie Provinces. (Revision).
771	Gutteridge, H. S., and F. S. Nowosad. Pasture for poultry. (Revision).
786	Whiting, F. Feedlot finishing of cattle and sheep in irrigated areas of southern Alberta. (Revision).
796	Oliver, R. W. Annual flowers for Canadian gardens. (Revision).
805	White, W. J., R. M. MacVicar, and F. S. Nowosad. Reed canary grass. (French).
865	Williams, S. B. Breeding for market lamb production. (Reprint).
873	Williams, S. B., and W. H. Hough. The shepherd's calendar. (Reprint).
899	Oliver, R. W. Hedges for Canadian gardens. (Reprint).
922	Lapins, K. Identification of nursery stock.
929	Logan, V. S. Grass silage in the dairy cattle ration.
947	Walkof, C., and V. W. Nuttall. Hybrid vegetables for short season gardens.
954	Wilcox, J. C., and C. H. Ferries. A comparison of furrow and sprinkler irrigation in the Okanagan Valley. (co-op. Mkt. Serv.).
955	Sylvestre, P. E., and E. Mercier. Feeding grass silage to beef cattle.
959	Oliver, R. W. Planning farm home grounds.

PROCESSED BULLETINS

An economic study of furrow and sprinkler irrigation of tree fruits in the Okanagan Valley. (co-op. Mkt. Serv.).
Controlled atmosphere storage of apples.
Crop variety guide for the Atlantic Provinces.
Experimental Farm highlights in the Atlantic Provinces, 1954.
Feeding for egg production.
Gas storage of apples in Nova Scotia.
Handbook of the range plants of British Columbia.
Latent evaporation: its concept, measurement, and application.
New fruits from Summerland, British Columbia.
Preservation of candied fruits and related products. Part I.
Stock-poisoning plants of British Columbia.
Tree fruits of the Okanagan Valley.
Tubular heat exchange equipment for processing honey.

SOIL SURVEY REPORTS AND MAPS

(In co-operation with Provincial Departments)

Winnipeg and Morris Map Sheet Area. Report No. 5, Manitoba Soil Survey.
Antigonish County, Report No. 6, Nova Scotia Soil Survey.
Stormont County, Report No. 20, Ontario Soil Survey.
York County, Report No. 19, Ontario Soil Survey.
Peel County, Report No. 18, Ontario Soil Survey.

PRESS ARTICLES

Distributed by Information Service.....	437
Distributed locally	541
Special articles for weeklies and magazines.....	152

MIMEOGRAPHED REPORTS

Summarized annual reports and other mimeographed material have been prepared and distributed by all Divisions and Branch Experimental Farms.

DIVISIONAL PERIODICALS

Animal Husbandry Newsletter.....	4 issues yearly
Cereal News.....	4 issues yearly
Forage Notes.....	4 issues yearly
Horticulture Bi-monthly Report.....	6 issues yearly
Tobacco Lighter.....	4 issues yearly

CONFERENCE AND COMMITTEE PAPERS

Experimental Farms' staff have contributed to the following:

Proc. Can. Soc. Anim. Prod. 1955. 16 papers.
Proc. Ann. Conf. Manitoba Agron. 1955. 8 papers.
Proc. Ann. Conf. Natl. Weed Comm. 1955. 23 papers.
Proc. 12th North Cent. Weed Control Conf. 1955. 8 papers.
Proc. Prov. Soil Fertility Comm. and Fertilizer Bds. 1955. 4 papers.
Proc. Western Forage Crops Conf. 1955. 14 papers.
Proc. Western Can. Soc. Hort. 1955. 25 papers.

A large number of papers at meetings of associate committees of the National Research Council, Canadian Universities, and the Department of Agriculture dealing with such subjects as plant breeding, grain research, animal nutrition, and food preservation.

RESEARCH AND MISCELLANEOUS PAPERS

In addition, the following papers have been published:

ANIMAL HUSBANDRY

Research

Banky, E. C., and S. B. Slen.

Note on the effect of non-uniformity of the cross-sectional area upon the tensile strength of wool fibers. Text. Res. J. 25: 358-361. 1955.

- Fredeen, H. T., G. H. Bowman, and J. G. Stothart.
Appraisal of certain methods for evaluation of ham quality. *Can. J. Agr. Sci.* 35: 91-94. 1955.
- Fredeen, H. T., G. H. Bowman, and J. G. Stothart.
Relationships between certain measurements of ham and carcass quality. *Can. J. Agr. Sci.* 35: 95-99. 1955.
- Hickman, C. G., and C. R. Henderson.
Components of the relationship between level of production and rate of maturity in dairy cattle. *J. Dairy Sci.* 38: 883-890. 1955. (co-op. Cornell Univ.).
- Hough, W. H., H. J. Bearden, and W. Hansel.
Further studies on factors affecting ovulation in the cow. *J. Anim. Sci.* 14: 739-745. 1955. (co-op. Cornell Univ.).
- Jones, A. R., L. M. Bezeau, B. D. Owen, and F. Whiting.
The effect of mold growth on the digestibility and feeding value of grain for swine and sheep. *Can. J. Agr. Sci.* 35: 525-532. 1955.
- Kristjansson, F. K., and R. Gwatkin.
The effect of infectious atrophic rhinitis on weight for age in swine. *Can. J. Agr. Sci.* 35: 139-143. 1955. (co-op. Prod. Serv.).
- Slen, S. B., and F. Whiting.
Wool and lamb production as affected by the source of protein in the ration of the mature ewe. *J. Anim. Sci.* 14: 844-859. 1955.
- Slen, S. B., and F. Whiting.
Wool growth in mature range ewes as affected by stage and type of pregnancy and type of rearing. *Can. J. Agr. Sci.* 36: 8-13. 1956.
- Smoliak, S., and H. F. Peters.
Climatic effects on foraging performance of beef cows on winter range. *Can. J. Agr. Sci.* 35: 213-216. 1955.
- Whiting, F., and R. D. Clark.
The concentrate to roughage ratio in the ration as it affects the performance of rams. *Can. J. Agr. Sci.* 35: 518-524. 1955.
- Whiting, F., and R. D. Clark.
Raising dairy calves with a limited amount of milk. *Can. J. Agri. Sci.* 35: 454-460. 1955.

Miscellaneous

- Hickman, C. G.
A new era of dairy cattle breeding. *Agr. Inst. Rev.* 10 (1): 11-12, 49. 1955.
- Nicholson, H. N.
Bloat research. *Agr. Inst. Rev.* 10 (2): 53-54. 1955.
- Pigden, W. J.
Methods and problems of measuring herbage consumption. *Agr. Inst. Rev.* 10 (2): 55-57. 1955.
- Smoliak, S., and J. A. B. McArthur.
Range management. *Can. Cattleman* 18 (6): 11, 32-33. 1955.
- Stothart, J. G., and H. T. Fredeen.
A new breed of bacon hogs for Canada. *Agr. Inst. Rev.* 10 (4): 11-13. 1955.

APICULTURE

Research

- Katznelson, H., C. A. Jamieson, and G. H. Austin.
Further studies on the chemotherapy of diseases of the honeybee. *Can. J. Agr. Sci.* 35: 189-192. 1955. (co-op. Sci. Serv.).

Miscellaneous

- Jamieson, C. A.
Nosema disease and its control with fumagillin. *Am. Bee J.* 95 (3): 94-95. 1955.
- Jamieson, C. A.
Some factors influencing the crystallization of honey. *Iowa State Apiarist Rept.*, 1954, pp. 64-73. [1955].
- Jamieson, C. A.
Beekeeping and honey production in Canada. *Encyclopedia Canadiana*. 1955.

Research

- Bendelow, V. M., and W. O. S. Meredith.
Reliability of prediction tests for malting quality. *Can. J. Agr. Sci.* 35: 252-258. 1955. (co-op. Dept. Trade and Comm.).
- Hamilton, D. G., S. Symko, and J. W. Morrison.
An anomalous cross between *Hordeum leporinum* and *Hordeum vulgare*. *Can. J. Agr. Sci.* 35: 287-293. 1955.
- Morrison, J. W.
Fertilization and post-fertilization development in wheat. *Can. J. Bot.* 33: 168-176. 1955.
- Morrison, J. W.
Dicentrics in wheat. *Science* 121: 604-605. 1955.
- Morrison, J. W., and Shu-Chang Lin.
Chromosomes and nucleoli in *Pisum sativum*. *Nature* 175: 343-344. 1955.
- Welsh, J. N., B. Peturson, and J. E. Machacek.
Associated inheritance of reaction to races of crown rust, *Puccinia coronata avenae* Eriks., and to Victoria blight, *Helminthosporium victorae* M. and M., in oats. *Can. J. Bot.* 32: 55-68. 1954. (co-op. Sci. Serv.).

Miscellaneous

- Gfeller, F.
Plant growth chambers and their use in plant breeding. *Commonwealth Phytopath. News.* October. 1955.
- Peterson, R. F.
International co-operation in wheat breeding. *Agr. Inst. Rev.* 11 (1): 16-17, 45. 1956.
- Whiteside, A. G. O.
Methods and successes in improving wheat quality in Canada. *Die Qualitätszuchtung von Brotgetreide. Arbeitsgem. Getreidforsch.*: 165-168. Detmold. 1954.
- Zillinsky, F. J.
Oat breeding and research in Canada. *Agr. Inst. Rev.* 10 (6): 11-13, 56. 1955.

FIELD HUSBANDRY, SOILS AND AGRICULTURAL ENGINEERING

Research

- Bolton, E. F., J. M. Fulton, and J. W. Aylesworth.
The effect of two soil conditioners on some physical properties of a Brookston clay soil. *Can. J. Agr. Sci.* 35: 51-57. 1955.
- Cann, D. B., and E. P. Whiteside.
A study of the genesis of a podzol-gray-brown podzolic intergrade soil profile in Michigan. *Soil Sci. Soc. Am. Proc.* 19: 497-501. 1955. (co-op. Mich. State Coll.).
- Cordukes, W. E., A. J. MacLean, and R. F. Bishop.
The comparative effect of manure and commercial fertilizer in a long-term soil fertility experiment. *Can. J. Agr. Sci.* 35: 229-237. 1955. (co-op. Sci. Serv.).
- Dufour, L., R. P. Niedermeier, C. E. Zehner, and J. W. Crowley.
Sulfur dioxide as a preservative for high moisture legume silage. *J. Dairy Sci.* 38: 52-57. 1954. (co-op. Univ. Wisconsin).
- Dubetz, S., G. C. Russell, and K. W. Hill.
Crop sequence studies on irrigated land in southern Alberta. *Can. J. Agr. Sci.* 35: 564-567. 1955.
- Ehrlich, W. A., H. M. Rice, and J. H. Ellis.
Influence of the composition of parent materials on soil formation in Manitoba. *Can. J. Agr. Sci.* 35: 407-421. 1955 (co-op. Sci. Serv. and Univ. Manitoba).
- Ehrlich, W. A., and H. M. Rice.
Post-glacial weathering of Mankato till in Manitoba. *J. Geol.* 63: 527-537. 1955. (co-op. Sci. Serv.).
- Fulton, J. M., and H. F. Murwin.
The relationship between available soil moisture levels and potato yields. *Can. J. Agr. Sci.* 35: 552-556. 1955.
- Leahey, A.
Soil and agricultural problems in the sub-Arctic and Arctic Canada. *J. Arctic Inst. N. Am.* 7: 249-254. 1954.

- MacLean, A. A., J. J. Doyle, and F. G. Hamlyn.
Fertility studies on some New Brunswick soils I. Soil phosphorus supply as shown by greenhouse and chemical tests. *Can. J. Agr. Sci.* 35: 388-396. 1955.
- Magee, A. I.
Tuber bruising and potato digger operations. *Emp. J. Expt. Agr.* 23: 45-48. 1955.
- Moss, H. C., and R. J. St. Arnaud.
Grey-wooded (podzolic) soils of Saskatchewan, Canada. *J. Soil Sci.* 6: 293-311. 1955.
- Ouellette, G. J.
Tolerance de la luzerne aux conditions associées aux sols acides. *Ann. l'ACFAS* 20: 72-79. 1954.
- Robertson, G. W.
Low-temperature fog at the Edmonton airport as influenced by moisture from the combustion of natural gas. *Quart. J. Roy. Meteor. Soc.* 81 (348): 190-197. 1955.
- Robertson, G. W.
The standardization of the measurement of evaporation as a climatic factor. *World Meteor. Org. Geneva* 42 (16): 1-10. 1955.

Miscellaneous

- Anderson, D. T.
Sugar beet mechanization in Canada. *Agr. Inst. Rev.* 11 (1): 11-13, 58. 1956.
- Bowser, W. E.
Report to the Government of Pakistan on soil survey and land use. F.A.O. Report 315. 1955.
- Cordukes, W. E.
Making grass and legume silage. *Agr. Inst. Rev.* 10 (2): 31-33. 1955.
- Dessureaux, L., F. M. Gauthier, and G. J. Ouellette.
Research on Ladino white clover. *Eastern Can. Soc. Agron. Proc.* 4: 3-12. 1953.
- Gauthier, F. M., and E. Godbout.
La culture des racines est profitable pour les petites fermes. *Agriculture (Quebec)* 12 (1): 10-12. 1955.
- Hill, K. W.
Grassland crops for hay, silage, and pasture. *Agr. Inst. Rev.* 10 (2): 12-14. 1955.
- Kalbfleisch, W.
Harvesting and feeding equipment for grasses and legumes. *Agr. Inst. Rev.* 10 (2): 38-40. 1955.
- Langmaid, K. K.
The geology of New Brunswick soils. *Proc. 1st Maritime Soil Mech. Conf.*, pp. 4-5. 1955.
- Millette, J. F. G.
The usefulness of the New Brunswick soil survey reports to engineers. *Proc. 1st Maritime Soil Mech. Conf.*, pp. 6-10. 1955.
- Millette, J. F. G.
Report on soil surveys. *Ann. Rept. New Brunswick Dept. Agr.*, pp. 87-88. 1954.
- Ripley, P. O.
Fertility of grasslands—grassland agriculture. *Agr. Inst. Rev.* 10 (2): 17-20. 1955.

FORAGE CROPS

Research

- Knowles, R. P.
A study of variability in crested wheat grass. *Can. J. Bot.* 33: 534-546. 1955.
- MacVicar, R. M., and D. R. Gibson.
The use of desiccants for the pre-harvest treatment of legume seed crops. *Can. J. Agr. Sci.* 35: 83-90. 1955.
- Peake, R. W., and M. W. Cormack.
Effect of bacterial wilt on hay yield of irrigated alfalfa. *Can. J. Agr. Sci.* 35: 202-210. 1955.
- Putt, E. D.
Note on the value of cotton and paper bags for self-fertilizing sunflowers. *Can. J. Agr. Sci.* 34: 326-327. 1954.

- Putt, E. D., and Emilio Rojas M.
Field studies on the inheritance of resistance to rust in the cultivated sunflower *Helianthus annuus* L. Can. J. Agr. Sci. 35: 557-563. 1955.
- Putt, E. D., and W. E. Sackston.
Rust resistance in sunflowers. *Helianthus annuus* L. Nature 176: 77. 1954.
- Twamley, B. E.
Flower colour inheritance in diploid and tetraploid alfalfa. Can. J. Agr. Sci. 33: 461-476. 1953.

Miscellaneous

- Bordeleau, R.
Observations on the introduction of birdsfoot trefoil in soils of low fertility. La Revue d'Oka 29 (4): 84. 1955.
- Campbell, J. B.
The improvement of native grasses and rangelands. Agr. Inst. Rev. 10 (3): 24-26. 1955.
- Campbell, J. B.
The weigh scale mystery. Can. Cattleman 18 (10): 11-13. 1955.
- Campbell, J. B.
Report to the Government of Iceland on soil conservation and pasture management. F.A.O. Report 363. 1955.
- Campbell, J. B., and R. W. Lodge.
A sturdy cage for range and pasture study. J. Range Mgmt. 8 (3): 123. 1955.
- Doran, W. J.
The effect of harvesting practices on yield and winter survival of alfalfa in central Alberta. Agr. Inst. Rev. 10 (3): 39. 1955.
- Stevenson, T. M.
What is being done in the development of the grasses. Agr. Inst. Rev. 10 (2): 42-44. 1955.
- Tisdale, E. W., A. McLean, and S. E. Clarke.
Range resources and their management in British Columbia. J. Range Mgmt. 7 (1): 3-9. 1954.
- Weiss, M. G., and T. M. Stevenson.
Registration of soybean varieties. Agron. J. 47: 541-543. 1955.
- White, W. J.
Methods of establishing stands of grassland crops. Agr. Inst. Rev. 10 (2): 15-16. 1955.
- White, W. J.
Silage in Saskatchewan. Univ. Sask. Ext. Bull. 132. 1955.

HORTICULTURE

Research

- Bishop, C. J., and L. E. Aalders.
A comparison of the morphological effects of thermal neutron and x-irradiation of apple scions. Am. J. Bot. 42: 618-623. 1955.
- Bowen, J. F., and E. S. Smith.
Sporulation in *Clostridium pasteurianum*. Food Res. 20 (6): 655-658. 1955.
- Cram, W. H.
Self-compatibility of *Caragana arborescens* Lam. Can. J. Bot. 33: 149-155. 1955.
- Cram, W. H., and O. Vaartaja.
Toxicity of eight pesticides to spruce and caragana seed. Forestry Chron. 31: 247-249. 1955.
- Eaves, C. A., and J. S. Leefe.
Influence of orchard nutrition upon the acidity relationships in Cortland apples. J. Hort. Sci. 30: 86-96. 1955.
- Ferries, C. H., and J. C. Wilcox.
Comparative costs of furrow and sprinkler irrigation of tree fruits in the Okanagan Valley. Econ. Analyst 25: 63-66. 1955. (co-op. Mkt. Serv.).
- Fisher, D. V., and S. W. Porritt.
Some recent studies in late harvesting and delayed cold storage of Bartlett pears. Proc. Am. Soc. Hort. Sci. 65: 223-230. 1955.
- Heeney, H. B., R. F. Bishop, and H. Hill.
The relationship of soil phosphorus tests to crop yield and to the requirement of the tomato for phosphatic fertilizer. Can. J. Agr. Sci. 35: 11-18. 1955. (co-op. Sci. Serv.).

- Kitson, J. A., and C. C. Strachan.
Metallic discoloration of candied fruits. *J. Food Tech.* 9: 582-584. 1955. (co-op. Sci. Serv.).
- Kitson, J. A., C. C. Strachan, and R. F. Cain.
Rapid sugar extraction procedure for analysis of candied fruits, jams, and fresh fruits. *Agr. Food Chem.* 3: 863-864. 1955. (co-op. Sci. Serv.).
- MacKay, D. C., and W. A. DeLong.
Co-ordinated soil-plant analysis. III. Exchange equilibria in soil suspensions as possible indicators of potassium availability. *Can. J. Agr. Sci.* 35: 181-188. 1955. (co-op. McGill Univ.).
- Moyls, A. W., F. E. Atkinson, C. C. Strachan, and Dorothy Britton.
Preparation and storage of canned berry and berry-apple pie fillings. *J. Food Tech.* 9: 629-632. 1955.
- Nelson, S. H., and H. B. Tukey.
Effects of controlled root temperature on the growth of East Malling rootstocks in water culture. *J. Hort. Sci.* 31: 55-63. 1956. (co-op. Mich. State Coll.).
- Nonnecke, I. L., and G. A. Kemp.
Disease resistance in wild tomato species. Frost tolerance. *Ohio Agr. Expt. Sta. Res. Bull.* 752. 1955.
- Phillips, W. R., P. A. Poapst, and B. J. Rheaume.
The effect of temperature near 32° F. on the storage behaviour of McIntosh apples. *Proc. Am. Soc. Hort. Sci.* 65: 214-222. 1955. (co-op. Sci. Serv.).
- Sampson, D. R.
Studies on the progeny of triploid *Philadelphus* and *Forsythia*. *J. Arnold Arbor.* 36: 369-383. 1955.
- Shewfelt, A. L., D. R. Brown, and K. D. Troop.
The relationship of mealiness in cooked potatoes to certain microscopic observations of the raw and cooked product. *Can. J. Agr. Sci.* 35: 513-517. 1955.
- Strachan, C. C., and F. E. Atkinson.
Effect of sucrose-invert and high conversion glucose syrups in the preparation of candied cherries. *J. Food Tech.* 9: 518-520. 1955.
- Wilcox, J. C., and J. M. McDougald.
Water distribution patterns from rotary sprinklers. *Can. J. Agr. Sci.* 35: 217-228. 1955.
- Wilner, J.
The effect of low temperature on available soil moisture during winters on the Canadian Prairies. *Agron. J.* 47: 411-413. 1955.

Miscellaneous

- Barrett, A. E.
Hop production in Canada. *Encyclopedia Canadiana.* 1955.
- Blair, D. S.
Pruning investigations. *Ann. Rept. Que. Pomol. Fruit Growing Soc.* 1954, pp. 17-22. [1955].
- Ferguson, W., and J. J. Jasmin.
Chemical Weed control in onion, squash, and tomatoes. *Proc. 9th Ann. Meeting N.E. Weed Control Conf.* 169-175. 1955.
- Nelson, S. H.
Malus understocks from softwood cuttings. *Can. Assoc. Nurserymen Res. Bull.* pp. 4-7, Dec. 1955.
- Nelson, S. H.
A note on the propagation of apple rootstocks by leaf-bud cuttings. *Am. Nurseryman* 102: 11. 1955.
- Nelson, S. H., and R. W. Oliver.
Summer propagation at the Horticulture Division, Central Experimental Farm, Ottawa. *Can. Assoc. Nurserymen Res. Bull.* p. 2, Dec. 1955.
- Nelson, S. H., and H. B. Tukey.
Root temperature affects the performance of East Malling rootstocks. *Quart. Bull. Mich. Agr. Expt. Sta.* 38: 46-51. 1955. (co-op. Mich. State Coll.).
- Shewfelt, A. L.
Advances in food technology. *Can. Food Ind.* 26: 28-33. 1955.
- Wilcox, J. C., T. G. Willis, and W. L. Jacobson.
Irrigation of grassland. *Agr. Inst. Rev.* 10 (2): 21-23. 1955.

Research

- Blakely, R. M., J. R. Jowsey, and H. I. MacGregor.
The effect of sodium bentonite in the diets of turkey poults. *Poul. Sci.* 34: 1181. 1955.
- Charette, L. A., and J. L. Tessier.
Snow as a water replacement for poultry. *Can. J. Agr. Sci.* 35: 175-180. 1955.
- Cook, F. D., J. R. Jowsey, R. M. Blakely, and H. I. MacGregor.
The effect of massive doses of *Escherichia coli* in the feed of turkey poults, on the growth of intestinal microflora. *Poul. Sci.* 34: 1188. 1955.
- Fredeen, H. T.
Influence of protamone therapy on the reproductive performance of two breeds of chickens. *Poul. Sci.* 32: 99. 1953.
- Gowe, R. S.
A comparison of the egg production of seven White Leghorn strains housed in two environments—floor pens and laying batteries. *Poul. Sci.* 34: 1198. 1955.
- Griesbach, L.
A comparison of floor radiant heating and standard hover methods for brooding chicks. *Poul. Sci.* 28: 765. 1949.
- Griesbach, L.
The genetic basis for lack of color in white mutants of Light Sussex poultry. *Poul. Sci.* 32: 367. 1953.
- Johnson, A. S., and E. S. Merritt.
Heritability of albumen height and specific gravity of eggs from White Leghorns and Barred Rocks and the correlation of these traits with egg production. *Poul. Sci.* 34: 578-587. 1955.
- Johnson, A. S., and V. S. Asmundson.
The heritability of weight of pectoral muscles of turkeys and the correlations between various body measurements and pectoral muscle weight. *Poul. Sci.* 34: 1203-1204. 1955. (co-op. Univ. California).
- Linblad, G. S., J. R. Aitken, and W. G. Hunsaker.
Studies on the use of barley in broiler rations. *Poul. Sci.* 34: 1208. 1955.
- Lindblad, G. S., W. G. Hunsaker, and J. R. Aitken.
The influence of penicillin, aureomycin, and 3-nitro-4-hydroxyphenylarsonic acid on the growth of goslings. *Poul. Sci.* 34: 1259-1261. 1955.
- MacIntyre, T. M.
The digestibility of dried ground seaweed meal by the laying hen. *Can. J. Agr. Sci.* 35: 168-174. 1955.
- MacIntyre, T. M., and M. H. Jenkins.
Effect of different feeding methods on the efficiency of egg production. *Poul. Sci.* 34: 376-383. 1955.
- Merritt, E. S., and R. S. Gowe.
Environment and poultry breeding problems. III. The performance of eight crossbred and two purebred broiler strains at three locations. *Can. J. Agr. Sci.* 36: 72-80. 1956.

Miscellaneous

- Blakely, R. M.
Poult brooding on the Prairies. *Can. Poultryman* 42: 6-10. 1955.
- Gutteridge, H. S.
Pasture for poultry. *Can. Poul. Rev.* 80 (2): 9-12. 1956.
- Johnson, A. S.
Turkey breeding principles. *Can. Poul. Rev.* 78 (3): 57-59. 1954.
- Johnson, A. S.
Turkey production and marketing. *Can. Poul. Rev.* 78 (11): 51-52. 1954.
- Lemay, A.
Influence de la conformation de la poitrine sur la ponte. *L'Aviculteur Québécois* 10 (10): 7. 1955.
- Wolff, N. H., and L. Griesbach.
Equipment for medication. (Treating coccidiosis in pens equipped with automatic water bowls). *Can. Poul. Rev.* 78 (10): 16. 1954.

Research

McEvoy, E. T.

Interaction of sodium and potassium on growth and mineral content of flue-cured tobacco. *Can. J. Agr. Sci.* 35: 294-299. 1955.*Miscellaneous*

MacRae, N. A.

The tobacco industry of Canada. *Encyclopedia Canadiana*. 1955.

OTHER PUBLIC RELATIONS

A very large number of visitors is received annually at Experimental Farms' units throughout Canada. There is close co-operation with representatives of Provincial agricultural extension services in organizing field days and arranging visits of groups of farmers.

In addition, staff members assisted at fairs, exhibitions, and farmers' meetings.

During 1955, members of the Experimental Farms Service participated in over 400 radio and television programs.

EXPERIMENTAL FARMS SERVICE

Continued from Inside Front Cover

ONTARIO

Central Experimental Farm, Ottawa.

Kapuskasing, Experimental Farm, F. X. Gosselin, B.S.A., Superintendent.

Harrow, Experimental Farm, H. F. Murwin, B.S.A., Superintendent.

Associated Substations: Delhi (Tobacco), L. S. Vickery, B.S.A., M.Sc., Officer-in-Charge; Woodslee (Clay Soils), J. W. Aylesworth, B.S.A., M.S., Officer-in-Charge.

Smithfield, Horticultural Substation, Associated with the Horticulture Division, Central Experimental Farm, Ottawa.

MANITOBA

Morden, Experimental Farm, C. C. Strachan, B.S.A., M.S., Ph.D., Superintendent.

Brandon, Experimental Farm, R. M. Hopper, B.S.A., M.Sc., Superintendent.

Associated Substations: Melita (Reclamation); Wabowden (Virgin Soils).

Portage la Prairie, Experimental Substation (Special Crops). E. M. Mackey, B.S.A., Officer-in-Charge.

Winnipeg, Cereal Breeding Laboratory, R. F. Peterson, B.S.A., M.Sc., Ph.D., Officer-in-Charge.

Associated with the Cereal Crops Division, Central Experimental Farm, Ottawa, Ontario.

SASKATCHEWAN

Indian Head, Experimental Farm, J. R. Foster, B.S.A., Superintendent.

Swift Current, Experimental Farm, G. N. Denike, B.S.A., Superintendent.

Scott, Experimental Farm, G. D. Matthews, B.S.A., Superintendent.

Regina, Experimental Farm, H.W. Leggett, B.S.A., B.Sc., Superintendent.

Melfort, Experimental Farm, H. E. Wilson, B.S.A., Superintendent.

Indian Head, Forest Nursery Station, John Walker, B.Sc., M.S., Superintendent.

Sutherland, Forest Nursery Station, W. L. Kerr, B.S.A., M.Sc., Superintendent.

Saskatoon, Forage Plants Laboratory, J. L. Bolton, B.S.A., M.Sc., Ph.D., Officer-in-Charge. Associated with the Forage Crops Division, Central Experimental Farm, Ottawa, Ontario.

Swift Current, Soil Research Laboratory, J. L. Doughty, B.S.A., M.Sc., Ph.D., Officer-in-Charge.

Associated with the Field Husbandry Division, Central Experimental Farm, Ottawa, Ontario.

ALBERTA

Lacombe, Experimental Farm, J. G. Stothart, B.S.A., M.Sc., Superintendent.

Associated Substation: Vegreville (Solonetz Soils).

Lethbridge, Experimental Farm, H. Chester, B.S.A., Superintendent.

Associated Substations: Vauxhall (Irrigation), W. L. Jacobson, B.S.A., Officer-in-Charge; Stavely (Range Management).

Beaverlodge, Experimental Farm, E.C. Stacey, B.A., M.Sc., Superintendent.

Manyberries, Range Experimental Farm, H.F. Peters, B.Sc., M.Sc., Superintendent.

Fort Vermilion, Experimental Farm, C. H. Anderson, B.Sc., M.Sc., Superintendent.

BRITISH COLUMBIA

Agassiz, Experimental Farm, M. F. Clarke, B.S.A., M.S.A., Ph.D., Superintendent.

Associated Substation: Boundary Bay (Potatoes).

Summerland, Experimental Farm, T. H. Anstey, B.S.A., M.S.A., Ph.D., Superintendent.


Associated Substation: Kelowna (Horticulture).

Prince George, Experimental Farm, W. T. Burns, B.S.A., M.Sc., Superintendent.

Saanichton, Experimental Farm, J. J. Woods, B.S.A., M.S.A., Superintendent.

Smithers, Experimental Farm, R. G. Savage, B.S.A., M.Sc., Superintendent.

Kamloops, Range Experimental Farm, T. G. Willis, B.S.A., M.S.A., Superintendent.



EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA 1957